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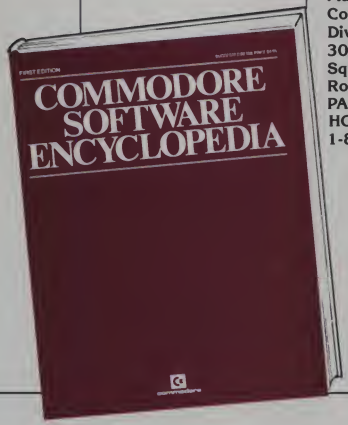

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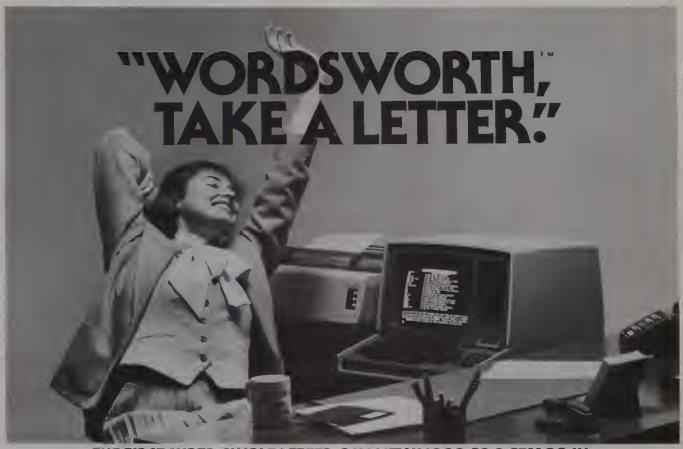

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the cover

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MEMBER MTA

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Arizona State University is hosting the 10th Annual Math/Science Conference emphasizing the following areas: The microcomputer as a medium for instruction, as a tool for research and as an information manager. A variety of workshops and demonstrations will be offered as well as panel discussions and problem solving groups.

This two day conference will be held on the Arizona State University campus on January 15 and 16, 1982.

Vendors interested in securing a booth are invited to contact Dr. Gary Bitter of Arizona State University, 203 Payne, Tempe, Arizona 85287 or phone (602) 965-3322.

For further information or registration materials write to: Nancy Watson, 203 Payne Hall, Arizona State University, Tempe, AZ 85287.

Price Changes

An investigation, prompted by several reader complaints has revealed that when Atari lowered the price of the Atari 400, and increased the memory to 16K, they also made the Basic cartridge an optional extra at $60. This makes a significant difference in the comparative charts on pages 35 and 189 of our 1981 Buyer's Guide issue, and brings the price of the 16K Atari 400 with Basic to approximately $450.

The price quoted for the 16K Apple II Plus should have been $1330. The 32K machine is priced at $1430, and the 48K at $1530.

"We must beware of what I call 'inert ideas'—ideas that are merely received into the mind without being utilized, or tested, or thrown into fresh new combinations."

Alfred North Whitehead

Additional Information

The program MyChess, mentioned in the article, "Of Cabbages and Kings" (August, 1981), is also available for the H-89 and Z-89 computers. This version, with graphics, can be obtained from The Software Toolworks, 14478 Glorietta Dr., Sherman Oaks, CA 91423 (213-986-4885). The disk costs $34.95 plus $2 postage and handling (specify HDOS or CP/M).

The illustration on page 68 of the September 1981 *Creative Computing* was "Moon and Sun" from *Micro Painter*, and is copyright 1981, Datasoft, Inc.

Additional ordering information for the book *Understanding Computer Systems* from which "Explaining Computer Related Concepts and Terminology" was excerpted in the October issue of *Creative Computing* was received too late to appear with the article.

In the U.S., *Understanding Computer Systems* can be ordered from Computer Science Press, 11 Taft Court, Rockville, MD 20850. In England and Ireland, order from Chartwell-Bratt, Old Oxchard, Bickley, Bromley, England. In Scandinavia and for other information contact Firma Lawson, Gustav Adolfsgatan 9, 582 20 Linkoping.

Cybernetics Conference

A conference sponsored by the American Society for Cybernetics will be held at the Marvin Center, George Washington University, Washington D.C. from Thursday, October 29 to Sunday, November 1, 1981.

The theme of the conference will be a redefinition of the field of cybernetics—both its intellectual and practical content.

For further information contact Dr. Laurence D. Richards, Department of Administrative Science, Colby College, Waterville, ME 04901; (207) 873-1131.

Computer Game of the Year

From among the multitude of computer games available, gamers from all over the U.S. recently chose their favorite computer game, and the honor went to Automated Simulations, Inc. for its fantasy role-playing game, "Temple of Apshai."

Each year the Academy of Adventure Gaming Arts and Design, a group of hobby industry manufacturers, wholesalers, publishers and others, sponsors the "Charles Roberts" awards for excellence in game design. This is the first year the awards included a category for computer games.

Call for Papers

The Journal of Computer-Based Instruction is seeking papers on quality studies that deal with a variety of computer uses in health sciences education. The following areas are representative but not inclusive: innovative uses of the computer for education, studies that use the computer for stimulus presentation and data recording, integration of computer based education (CBE) into the curriculum, and models for utilizing CBE in the health sciences curriculum.

Papers from all health sciences are desired, including medicine, dentistry, nursing and allied health. It is expected that this issue will represent "state-of-the-art" research in computer-based education. Outlines of papers should be received by October 30, 1981.

For further information and guidelines for submission of outlines and papers contact: David P. Yens, Ph.D., Special Issue on Health Sciences Education Editor, JCBI, Mount Sinai School of Medicine, Annenberg Building 5-16, One Gustave L. Levy Place, New York, NY 10029.

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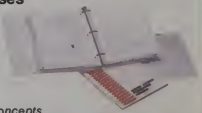

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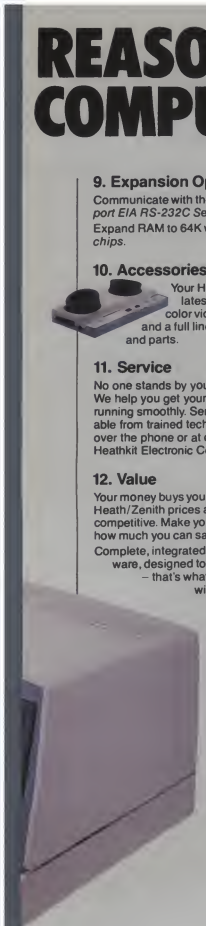

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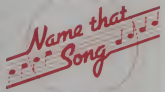
On Cassette — $19.95 On Diskette — $22.95

NAME THAT SONG
By Jerry White



Here is great entertainment for everyone! Two players listen while the Atari starts playing a tune. As soon as a player thinks he knows the name of the song, he presses his assigned key or joystick button. There are two ways to play. The first way requires you to type in the name of the song. Optionally, you can play multiple choice, where the computer asks you to select the title from four possibilities. The standard version requires 24K of RAM (32K on diskette) and has over 150 songs on it. You also get a 16K version that has more than 85 songs. The instructions explain how you can add songs to the program, if you wish. Written in BASIC.

On Cassette — $14.95 On Diskette — $17.95

QS FORTH
By James Albanese

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Diskette and Manual — $79.95 Manual Only — $39.95

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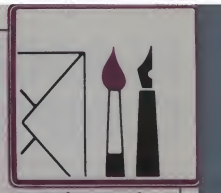

..input/output..

Cerf's Up

Dear Editor:

We enjoyed your recent articles on computer Othello. We are concerned, however, that some of the square ranking recommendations contained in these articles may lead programmers astray. A recent informal survey of the best players and programmers in the United States Othello Association produced a virtually unanimous judgment: programs based upon the old idea of "square values" suffer from an inherent weakness which severely limits their potential. They may be quite effective against random play or against programs which maximize disc-count at each move, but they will be no match for programs based on more up-to-date strategies.

Today's best Othello players (be they human or machine) are not particularly concerned with occupying the so-called "good" squares. Rather they seek to gain control of the game by so restricting their opponent's flexibility (that is, their opponent's store of legal options at each turn) they can for all practical purposes dictate where their opponent must move. It is sometimes possible to engineer this type of advantage relatively early in the game, and properly handled, it can often be perpetuated until such time as the controlling player can begin to accumulate stable (permanently unflippable) discs.

Given the above, we believe that the strategy advice offered by Stephen Kimmel (which leans heavily on Goro Hasegawa's lamentable "How to Win at Othello") is extremely unreliable, and that the algorithm offered by David Levy could be improved in two ways.

First, "structural" factors (square rankings) should be all but eliminated, perhaps retaining only a slight positive value for unoccupied corners and negative values for the contiguous squares. Second, the computer should monitor the opposition's "mobility" as well as its own, striving to minimize the former and maximize the latter. This will insure that the program thinks offensively as well as defensively.

The quality of Othello programming is improving rapidly, and some excellent work has recently been done by Paul Rosenbloom, Charlie Heath, Dan and Kathe Spracklen, and Peter Frey and Larry Atkin, to name only a few. In order to stimulate further improvement, the United States Othello Association is currently organizing a 1982 computer Othello tournament; anyone interested in participating should write: USOA, P.O. Box 342, Falls Church, VA 22046.

Jonathan Cerf
World Othello Champion
George Sullivan
Editor, *Othello Quarterly*
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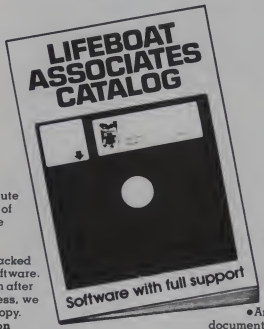

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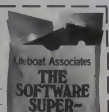

Square Deal

Dear Editor:

I enjoyed Stephen Kimmel's article on the computer Othello tournament (*Creative Computing*, July, 1981). The author provided a delightful blow-by-blow account and the ultimate outcome was very satisfying—the good guy won.

I would like to inform your readers that the winning program is no longer available. I have recently finished a new Othello program which is written in assembly language for both the TRS-80 and Apple and is packed with user features.

It is available from Odesta Publishing, 920 Pitner Ave., Evanston, IL 60201.

I believe my new program, like its predecessor, is more than equal to the competition, and would welcome another tournament which pits my new program against all comers, including those which have recently been advertised as champions.

Peter W. Frey
Visiting Professor
University of California, Santa Cruz
Santa Cruz, CA 95064

Where Are You When We Need You?

Dear Editor:

I own an Ohio Scientific Challenger 1P, and I believe that my computer, and all OSI computers in general, are frequently misrepresented. OSI computers are continually left out of comparison lists of "Popular Computers" whether the article is about hardware, Basic, or other software. The annoying fact is that OSI is not there.

When an article does include OSI, i.e. "What can you buy for under $1000" (Vol. 7, No. 9) The facts sometimes get distorted. "The challenger format which includes a disk drive, C1PMF, offers 30K initially which can be expanded to 62K." Neither of the memory figures is correct. Due to I/O allocations, the C1P series cannot be expanded beyond 32K, expanding to 62K would mean pulling out the Basic ROMs, as they and the Monitor constitute the upper 10K of memory. (The 6502 can address only 64K of memory.)

With the new C1P series II, it is necessary to add a 630 expander board to the computer to get the new options: sound, joysticks, keypads and an important option you *didn't* include, VIC-like (or actually C4P-like) color.

Finally, you didn't bother to include OSI's C4P and C8P cassette-based computers in your article. These are still below $1000 before disks are added. As an OSI owner, I rarely see any articles pertaining to my computer, though I intend to write some. But I would like to see my computer get its fair share in general articles. Please try to help me out.

Howard Ship
P.O. Box 103
Randolph, MA 02368

We would like to print articles on the C1P, C4P, and C8P, but receive very few submissions. We need good articles and programs.—GB

Password Plus

Dear Editor:

In the August 1981 issue of *Creative Computing* a reader was puzzled over how to include passwords in a program, and keep them secret.

Here is one solution that I have found. The only way to do this is with a line editor, as you mentioned. A good one, is the "Progam Line Editor" (PLE) from Synergistic Software.

In a checkbook program I am developing I hide the password behind a REMark statement. Using the PLE, insert control-Hs within the remark statement to backspace over the line. For example, the following line is from my program:

```
3 PW$ = "HOBBIT":REM hhhhhhhhhhhhhhPASSWORD CODE \\\\
```

The "h" is a control-H and the "\" is a space. The line will be listed as:

```
3 PW$ = PASSWORD CODE
```

The control-Hs will backspace over the Rem and the password, then "PASSWORD CODE" will be printed over the line that you do not wish to be seen. It is important to include spaces at the end of the line so that any characters not covered by the message will be erased. You could wipe out the entire line if you wish; just include enough control-Hs and spaces to cover the line. You can even use control-Js to issue line feeds or control-Ks to move the cursor up a line or two.

Randy Reeves
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Hal Gerhardt

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IBM Personal Computer

The Big Blue Giant Makes Its Move

Betsy Staples

"Didn't they make any mistakes?" asked one of our staff members in disbelief upon hearing our description of the new IBM Personal Computer.

"Not that we could see," was the response.

The long-awaited, much-heralded, frequently-leaked IBM Personal Computer was introduced by IBM on August 12, 1981 at the largest press conference the company has hosted since the introduction of the 360 in the mid-1960s.

And, indeed, it appears that IBM has done just about everything right. Upon first inspection, the machine seems to have everything a personal computer user could want: high resolution graphics, sound, disk drives, printer, lots of memory, system software, business applications software, word processing software, game software, a reasonable price and the IBM name.

The new computer, which uses a 16-bit 8088 mpu, is designed for business, school and home use and, unlike other IBM products, doesn't even have a number. It is aimed squarely at the consumer market, as evidenced in another departure from IBM tradition, the decision to sell through retail stores. Beginning in October, the Personal Computer will be sold through participating ComputerLand dealers and Sears, Roebuck, and Co.'s new business machine stores. It will also be available through IBM Product Centers and a special sales unit in the Data Processing Division.

The price of the basic unit is $1565. A system with 64K of memory, monitor and disk drive would be around $3000, and an expanded system for business use with color graphics, two disk drives and printer would cost about $4500.

Hardware

The complete system consists of the "system unit" which houses the mpu, memory and optional disk drives; a 20" x 8" x 2" keyboard which attaches to the system unit with a 6' spiral cable; a monochrome display for which a black and white or color television may be substituted; and a dot matrix printer.

The printer bears a striking resemblance to the Epson MX-80, but members of the press were told that it could not possibly be an MX-80 since it has a two-tone case and the IBM logo on the front. Whatever its name, it prints at 80 cps bidirectionally, and features a 9 x 9 character matrix; 12 type styles; a choice of 40, 66, 80 or 132 characters per line; and page spacing and column skip for word processing. (A complete evaluation of the MX-80 can be found in *Creative Computing*, July 1981.)

It appears that IBM has done just about everything right.

A spokesman for IBM would not speculate on plans to offer a letter-quality printer, but added that the computer has a standard RS-232 interface and may be used with many of the printers currently on the market.

The memory is divided into 40K of ROM and 16K of user memory which may be expanded by combining plug-in chips and boards to 256K. The optional one or two disk drives acccomodate the 5 1/4" diskettes with a storage capacity of 160K bytes each. The system unit also contains five system expansion slots through which other peripherals, including communications devices and joysticks or paddles, may be connected.

The monochrome display offers 25 lines of 80 characters of text on an 11 1/2" screen, upper and lower case, underlining, high intensity blinking characters, and reverse image.

One of the nicest components of the system is the 83-key, typewriter-like keyboard, which offers access to 256 characters, including APL symbols and foreign punctuation marks. It includes a numeric keypad and 10 function keys, and features "tactile feedback" (IBMese for "very nice touch").

Graphics and Sound

Although the demonstration at the press conference was geared to the general press and did not provide much detail regarding the graphics and sound systems, it was quite apparent that these features will set it apart from its competition.

The color graphics system can display any of the 256 characters in any of 16 foreground and 8 background colors. There are two levels of resolution: medium, which is 320 x 200 pixels, and high, which is 640 x 200 pixels.

We were very impressed with the high speed animation with simultaneous sound (all in Basic) which composed part of the demonstration, and with the ability of the machine to create "business graphics"—graphs, pie charts, etc.—in color.

System Software

The "cassette level" of the Basic Interpreter is included in ROM on the basic system. It is based on Microsoft Basic; provides I/O instructions for entry and retrieval of data; and supports the keyboard, display, light pen and printer as well as a full complement of editing and mathematical functions.

The "diskette and advanced levels" are optional. The diskette extension supports the use of disk drives, while adding date, time of day and communications capabilities to the system. The advanced extension enchances the display graphics to include features such as point, circle and get/put display, while increasing light pen and joystick support for design work and home entertainment.

The IBM Personal Computer DOS supports the disk drives, allowing the user to write or read from disk, display a directory, and rename, erase, display or copy files.

Also available are a Pascal compiler and UCSD p-System, as well as CP/M-86 from Digital Research, all designed to allow easy transfer of currently available

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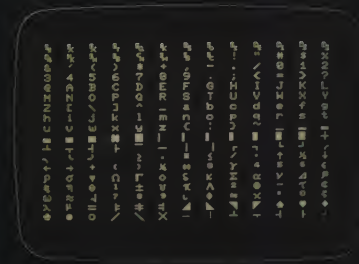

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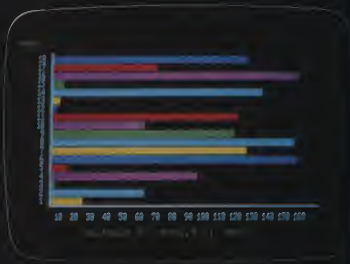

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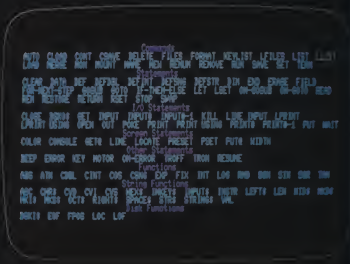

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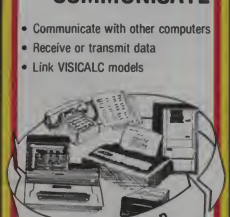
- Receive or transmit data
- Link VISICALC models



- Transfer stock price history from Dow Jones into VISICALC models.
- Put FOCUS reports into VISICALC.
- Use DATADEX files in VISICALC models.
- Link VISICALC P & L models too big to fit into memory.
- Put economic data from I.D.C. into VISICALC models.
- Other uses as creative as VISICALC itself!

Requires Apple II, Disk, Communications

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IBM, continued...

applications software to the new computer.

Applications Software

Undoubtedly the most useful of the optional applications packages offered by IBM is the familiar and popular VisiCalc from Personal Software. (See *Creative Computing*, August 1980).

Also available for business users are General Ledger, Accounts Receivable and Accounts Payable by Peachtree Software. And Easywriter from Information Unlimited Software has been chosen to provide word processing capabilities on the machine. (See *Creative Computing*, October 1980.)

Communications software allows users to access such data sources as Dow Jones New/Retrieval and The Source. IBM also intends to offer a full subset of 3270 emulation capabilities.

Finally, we were surprised to note that the bastion of "serious computing" lists Microsoft Adventure among the available applications for it newest computer.

So serious, in fact, does IBM appear to be about offering a library of interesting and useful applications software packages to their customers, that they have formed a new Personal Computer Software Publishing Department which will review and consider for publication software submitted by outside authors. Software information packets detailing the submission procedure may be obtained by writing: IBM Personal Computer Software Submissions, Dept. 765, Armonk, NY 10504.

Documentation

A cursory glance at the documentation in the demonstration area revealed several feet of manuals describing all aspects of the machine. Each is color coded and comes in a tidy little box. There was not a trace of a mimeographed or photocopied page in any of the books; they appear complete and ready for distribution.

Several of the manuals provide design specifications and information intended to encourage third party software and peripheral vendors to support the machine.

Service

Service is one of the things upon which IBM has built its reputation, and the company shows no signs of slacking off when it comes to the Personal Computer. The machines may be serviced at any of the retail outlets mentioned above, or the user may purchase an annual maintenance contract for between 10% and 15% of the price of the equipment. Under the maintenance contract, the customer calls IBM and specifies which part of the system is not working. Within 48 hours, a courier appears at the customer's door with a replacement for the defective unit.

The above information is based on observations made during demonstrations presented by IBM personnel and on literature provided by them. Watch these pages for an in-depth evaluation in which we will let you know if, indeed, IBM has succeeded in producing the perfect personal computer. □

We were very impressed with the high speed animation with simultaneous sound.

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One management consulting firm, for example, used the Shell-Metzner sort described in *Creative*, and saved $3000 a month, and we still receive letters thanking us for the hardhitting, candid, evaluation of word processing printers we published over a year ago, and which, incidentally, cost us several advertisers.

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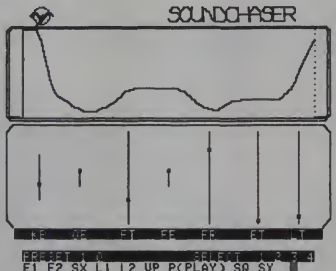

creative computing equipment evaluation

David Lubar

Passport Designs has given Apple owners a chance to become musicians, and musicians a reason to buy Apples. The Soundchaser Computer Music system integrates a keyboard, synthesizers, and software, producing a very nice package. The keyboard is a beauty, housed in wood and well made. The three-voice synthesizers are versatile, and contain dip switches for various settings. The software is easy to use and visually excellent. Set-up is fairly simple; the keyboard attaches by ribbon cable to a card in slot seven. Two synthesizer boards go into slots two and four. After connecting the cards to a speaker using standard RCA plugs (not included), the system is ready to run.

Upon booting the disk, the software brings in an orchestra. The orchestra consists of four instrument definitions and four sequences. A sequence is a series of notes and chords which can be cycled repeatedly, producing backup, rhythm, or half of a duet. The opening menu gives a choice of HELP, DISK, EDIT, or SEQ(uence). HELP provides a summary of the system. DISK allows the user to load or save files. EDIT is where instruments are created or altered. And SEQUENCE allows recording and playback of sequences.

The EDIT section presents a split graphics screen, beneath which are text items. The top half of the screen is used for displaying waveforms. The lower half contains a graphic representation of various slides and switches. The creation of instruments is rather fascinating, and can be educational as well. For instance, E1 is the amplitude envelope. Using one of the game paddles, the user can draw a new envelope, then mark the sustain portion. He can then immediately give a PLAY command, go to the keyboard, and hear the results of the change. With two envelopes (one for amplitude and one that modulates the pitch of the oscillator) and two low frequency oscillators under software control, the user can define a broad range of instrument sounds, and create special effects. It's quite interesting to hear the changes produced by relocating the sustain point or changing the shape of an envelope.

More control is offered through the voice panel. One switch changes the range of octaves available from the keyboard. With four positions on the switch, and four octaves on the keyboard, this produces a range of seven octaves, though, of course, the user is limited to four at any one time. Other switches assign the second envelope to the oscillator or filter. The slides control filter range, filter resonance, envelope time, and filter time. Adding to the options, dip switches on the synthesizer card select between square and triangle waves. There is enough power here for serious work, and plenty of flexibility for fun experimentation.

The EDITOR was tackled by a combined group of musicians and programmers. We were able to produce a variety of effects, ranging from pleasing organ tones to bizarre instruments that played one note when a key was pressed, followed by an octave scale after the key was released. The visual nature of the display greatly aided instrument development. Needless to say, both the musicians and the programmers had a good time.

Moving to the SEQUENCER, the instruments can be put through their paces. The first step is to select one of four instruments, assign it to a sequence, then lay down a track. The computer will record

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Sound Chaser, continued...

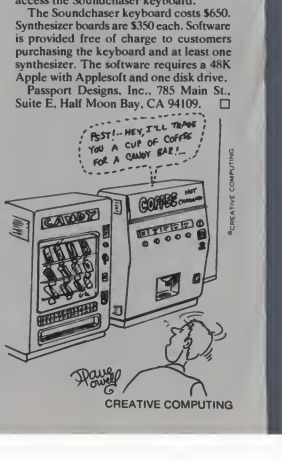
what is played, and replay it exactly, so timing is important. If the player makes a mistake, he has to do the whole thing over again. Not hard for a musician, but a task for those programmers who barely remember the bass line for *Heart and Soul*. With a sequence recorded, the fun starts. It can be replayed while something different is done live on the keyboard. A tempo control allows sequences to be replayed at sixteen different speeds. The new tempo is relative to the one used when the sequence was defined. Thus a sequence recorded at tempo eight can be played slower or faster. A sequence recorded at sixteen (the slowest tempo) can be speeded up but not played slower. The disk contains a good selection of sequences, mostly of the backup-rhythm sort. Pleasing sequences and instrument definitions can be saved to disk.

At the moment, the system is limited to six voices, though there is talk of interfacing it with the Mountain Card. Using two oscillators per voice, this would provide an eight-voice system. When playing live music along with a sequence, the keyboard has priority. Thus, if more than six notes are played simultaneously, notes will be dropped from the sequence.

The manual contains clear descriptions of all operations, accompanied with diagrams of the screen. An appendix on synthesizer functions includes good background information on the technical aspects of sound generation. For those with a bent toward machine language, the manual provides a sample assembler routine to access the Soundchaser keyboard.

The Soundchaser keyboard costs $650. Synthesizer boards are $350 each. Software is provided free of charge to customers purchasing the keyboard and at least one synthesizer. The software requires a 48K Apple with Applesoft and one disk drive.

Passport Designs, Inc., 785 Main St., Suite E, Half Moon Bay, CA 94109. □



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CIRCLE 281 ON READER SERVICE CARD

David H. Ahl

BELL LABS' 32-BIT MPU RUNS C AND UNIX

Bell Labs' MAC-32 is a true 32-bit mpu with every data and address bus, CPU register and instruction having 32 bits. With an effective clock rate of 32 MHz, the MAC-32 should grossly outperform virtually every other 16 and 32 bit mpu currently available.

Since the MAC-32 was designed for use in AT&T telecommunictions applications, it is optimized for data manipulation using C and Unix. As a result, it has many data types including words, half words, bytes, bit fields and blocks; split CPU control with separate fetch and execute units; and 16 on-chip registers of 32 bits each.

Although currently not intended for use outside of the Bell System, that could change with the advent of commercial marketing through the unregulated "Baby Bell" subsidiary.

CAN ACORN BECOME AN OAK TREE OVERNIGHT?

Acorn, a British firm founded in 1978 was doing nicely with their Atom kit computer. However, founder Christopher Curry convinced the BBC early this year that a new Acorn computer could meet the BBC's requirements for their TV educational courses.

Simultaneously, Acorn was negotiating with the Dept. of Industry to have an Acorn ccomputer approved for the Government 50% grant for secondary schools which install computers for teaching purposes.

Now, approved for both programs, Acorn has contracted for manufacturing at three plants in the U.K. as well planning additional production in Hong Kong, Australia and the United States

Cost of the Acorn BBC machine is about $500. Sure, apples are bigger than acorns. But oak trees are much bigger than apple trees.

THE MEDIA DISCOVERS COMPUTER SIMULATIONS

For news stories that last more than a week or so, media people start looking for new angles to keep the public interested. Lately these angles have involved several small computer software packages.

Creative Computing's Air Traffic Controller package was featured on the AP newswire which led to TV spots on NBC, ABC and PBS; ten radio interviews and numerous newspaper and magazine mentions including articles in Time and the Wall St. Journal (in which it shared the spotlight with Instant Software's Flightpath).

The persistent Medfly led Dick Milewski of The Software Works to quickly bring to market MedFly Mania, a simulation which explores ways to bring the fly under control. It, along with Creative Computing's STERL program (on the Ecology Simulations I package) were featured on many radio and TV shows in August and September. At the rate the flies are spreading, these two packages could have a long media life.

A year ago, Muse's Three-Mile Island program enjoyed similar attention.

Although it's nice to get free publicity, we'd just as soon avoid this kind for our rats infestation and malaria epidemic programs.

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CIRCLE 123 ON READER SERVICE CARD

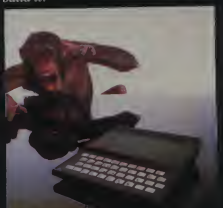
'The ZX81 is cased in sturdy black ABS plastic. And very nice it looks, too.'

'The machine offers no colour facilities and my guess is you shouldn't hold your breath waiting for them.'

'The basic ZX81 contains four chips... It's so simple, I think even I could build it.'

'Uncle Clive has come up with a lovely product with enormous appeal and which won't cost an arm and a leg.'

'...you'll have to be careful not to have your PAUSEs too close together, unless you enjoy watching the screen go absolutely bananas.'



'Finding your way round the keyboard is a real hoot — some of the keys have five functions.'

'...the single stroke keyword entry is a joy to use...'

'Hardly high resolution but better than a poke in the eye with a sharp stick!'

'Kids will love it (so will Dads)...'

'The idea of producing a superior machine to the ZX80 and selling it for a lower price is absolutely wonderful.'

'...I suspect that more than a few people who are already familiar with computers will buy one, just to have a bit of fun.'

'When loading a program, the pattern on the screen shows you when data is being recognized.'

creative computing equipment evaluation

This review of the Sinclair ZX81 is reprinted from our 'sister' publication, Personal Computer World *in England. Although the ZX81 was not yet available in the U.S. at the time this issue went to press (August 1981), we anticipate that if it has not been introduced by the time you read this, it will be in the near future. Prices mentioned have been converted to their approximate equivalents in U.S. dollars, and we expect that certain features peculiar to Britain (such as programs referring to pounds, shillings and pence) will be modified for the U.S. model.—EBS*

SINCLAIR ZX81

David Tebbutt

Right from the start, I had better explain that the ZX81 costs $100 in kit form and $150 ready-built and, as such, represents absolutely amazing value for money. Whatever shortcomings are highlighted in this Benchtest must be weighed against this fact.

Like the ZX80, its predecessor, the ZX81 will be available by mail-order and, by the time you read this, deliveries should be coming through. Clive Sinclair tells me that he plans to up production to 10,000 units per month starting in April and that he'll be producing 10,000 ZX80s to satisfy overseas demand, so, providing that 10,000 or fewer of you order the new machine per month, delivery should be swift.

Sinclair has been a bit cheeky in his advertisements. Under a column entitled 'New, improved features', he proceeds to mention three things that were included in the ZX80 when it was launched over a year ago!

For the benefit of those unfamiliar with the ZX80, it was the first ready-built computer to break the psychological $200 price barrier. It was well-made but looked slightly cheap in its lightweight plastic case and with its shiny keyplate. The 'keys' were printed on a plastic membrane with a metallised back; when each 'key' was pressed, the metallic back came in contact with PCB tracks, shorting them to complete the appropriate circuit. The system plugged into the domestic television to give an extremely clear display, and program storage could be made onto the home cassette recorder. The ZX80 came with 1k of user memory (RAM) and a 4k operating system/Basic language chip.

The main limitations of the ZX80 were the fact that it could not handle floating point numbers or cassette files. Also, when first launched, memory expansion came a bit expensive but this changed when the 16k plug-in RAM became available. The ZX80 certainly represented a great step forward and offered excellent value for money for people wanting to learn about computing.

So what in the ZX81 is new, compared with the ZX80? First, an extra 4k of ROM is provided, which allows 30-odd additional functions to be incorporated. This will also drive the printer (expected in the summer). I couldn't test this, but I have seen it working. It is an electrosensitive printer requiring aluminised paper, the surface of which is burnt off by an electrical discharge to reveal the black paper underneath. Don't study the photos too closely, because they show a model, not the real thing. The ZX81 costs an amazing $50 less than the ZX80, thanks to some neat design consolidation in a Ferranti chip custom-built to Sinclair's requirements. The total number of chips in the basic system is four, against the ZX80's 21. The ZX81 and its peripheral products are all cased in sturdy black ABS plastic. And very nice it looks, too.

Hardware

Although physically smaller than the ZX80, the new machine weighs in at 13oz, about 2oz heavier than its predecessor. The system needs a UHF television, a cassette recorder and a power supply to make it usable.

On my colour television the screen is a pleasant green and all characters are displayed in black. The machine offers no colour facilities and my guess is that you shouldn't hold your breath waiting for them. I suspect that a projection system based on three of Uncle Clive's miniature TV tubes might appear one day but, then again, I also suspect that he'd introduce another computer to take advantage of this. The display is 24 lines of 32 characters of which two lines are reserved for system messages and commands. Low resolution graphics are provided to give 64 by 44 plotting points. As with the ZX80, the display is very clear and rock-steady.

I'm pleased to see that the new power supply has its own plying lead for the attachment of a normal mains plug. (The ZX80 was awkwardly designed with an integral plug which often needed an additional socket or extension lead.) This power supply must give 600 mA at 9V but, since the ZX81 draws close to this, the standard power supplies actually give 700 mA and I would recommend that readers using their own supplies go for the higher rating, too.

Once again, the keyboard is formed by an underprinted plastic membrane which is everything-proof (water, chemicals, Coca-Cola, cigarette ash, monkeys, editors, etc). The keyboard layout is different from the ZX80's so, if you're upgrading, prepare to make a few mistakes at first. At the same time it is an improvement, since each keyword is frequently placed at or near its initial letter. (All you have to do now is learn the qwerty layout!)

Here are a few ideas for Uncle Clive: a plug-in battery pack, a plug-in single-line LCD display and a remote (infra-red or ultrasonic) facility so that you can sit in your armchair beaming the display information at an aerial adaptor on the television.

Compared with the ZX80, the ZX81 looks very smart indeed — one could almost say tasteful. It has a nice shape and texture and the keyboard is made of a non-reflective material, a definite improvement.

The plug-in 16k RAM pack fits to the edge of the PCB where it protrudes from the rear of the casing. The cursor takes a while to appear at switch-on, because the system is checking to see how much memory is present in order to set certain system variables. If you're a machine code freak you can reset the RAMTOP variables in order to give you somewhere safe to tuck your precious program.

Five screws hold the ZX81 together, three of them are hidden under the pads on which the machine stands (footpads? — surely not). You know what I mean —

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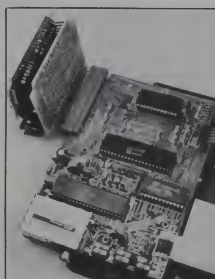

those non-skid things. There's a substantial heat sink for the regulator under the rear of the keyboard — it's a good place to warm your hands on a chilly morning. The PCB is held into the casing by two screws. The keyboard is separate from the main PCB and is connected to it by a couple of flat printed cables. The main PCB is well designed and neatly made. Assembly of the ZX81 is done very professionally by the Timex Corporation in Scotland (the same people that are making Sinclair's latest miniature television).

The basic ZX81 contains four chips — ROM, 3.5 MHz Z80A CPU, 1k memory and the Ferranti custom-made chip — plus a limited assortment of bits and pieces. It's very, very simple — I think even I could build it. A few spare positions on the board give the manufacturer a certain amount of flexibility to tweak the machine to the requirements of different television systems and to be prepared in case a memory chip famine occurs. The Ferranti chip handles all the I/O and control signals between the various elements of the machine. Nosing around inside, I notice that it has a very cosmopolitan flavour, with memory from Malaysia, the CPU and ROM from Japan, a UHF modulator from the Philippines, a regulator from El Salvador and the custom chip from Britain. The edge connector is not gold-plated (what do you expect for $150?); it's just the PCB printing taken out to the edge. The 16k RAM pack contains two boards connected at the edge. One board contains eight 4116s which are driven by the other board's assortment of seven chips which handle the memory addressing and refreshing.

Software

The ZX81 syntax-checking is excellent because, unlike the ZX80's, instead of operating on each character as it's entered, the system waits until NEWLINE is hit. Finding your way around the keyboard at first is a real hoot — some of the keys have five functions. As before, the single stroke keyboard entry is a joy to use and the automatic spacing inserted by the system makes program listings clearly legible. For example, if you tried to enter 10FORN=1TO10, it would appear as 10 FOR N=1 TO 10. Pretty neat, huh?

Editing is very simple. You position the cursor on the line to be modified, hit the EDIT key and then make your corrections. Additional characters and functions are automatically inserted at the cursor position within the line while RUBOUT deletes the character or function to the cursor's left. A touch on the NEWLINE key confirms the changes.

The machine can be used as a calculator but shouldn't be bought for that purpose since the precision is less than one would expect of such a device. It is, however, far better than the integer-only ZX80, offering $+/-10^{+/-38}$. If numbers get out of hand it presents results in standard scientific notation. For those who can't readily visualise this level of accuracy, it means numbers up to 4,294,967,295 can be represented with complete accuracy. That's $2^{32}-1$. The smallest positive number is about 4×10^{-39}. Five bytes are needed to store a number, which goes a long way to explaining why the Benchmark timings are slower than with the ZX80, which only required two.

An enormous number of functions have been crammed onto this rather small keyboard. This has been achieved by using two special keys: graphics, which allows the user to key all the graphic characters as well as the normal characters as white on black; and function, which allows the user access to (surprise, surprise!) special functions. A normal mode of operation also exists. In addition to all this, the keyboard has a bog-standard shift key, thus increasing the range of options for each key still further.

The character set is a one-off — it's not ASCII or anything I recognise. I think we'd be safe if we called it Clive code. The TV display isn't exactly memory-mapped — it tends to move around and change its size depending on what's going on. It is, however, possible to find the start of the screen area and then to access the screen by PEEKing and POKEing the screen locations in the buffer.

Basic

All but one of the ZX80's Basic functions, plus a substantial number of additions, have been incorporated into the 8k ROM which drives the ZX81. The following commands and statements are provided over and above the old ZX80 repertoire: ASN, ACS, ATN, COS, EXP, INKEYS, PI, SGN, SIN, SQR, INT, LEN, LN, TAN, VAL, <=, >=, <>, COPY, DIM$, FAST, FOR...

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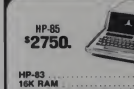

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CIRCLE 173 ON READER SERVICE CARD

ZX81, continued...

TO...STEP, LLIST, LLIST n, LPRINT, PAUSE, PLOT, PRINT AT, PRINT TAB, SCROLL, SLOW, UNPLOT. The missing function is TLS, which was used to return a string minus its first character. This ROM plus an appropriate keypad overlay is available to existing ZX80 users who wish to upgrade their machine. They should note, however, that even with the new ROM they will continue to get the screen flicker which, I'm sure, they've grown to know and love by now.

The machine can be operated in two modes — SLOW (sometimes called 'compute and display'), and FAST. FAST mode offers the world famous screen flicker every time you hit a key, while SLOW mode keeps the screen refreshed at all times, resulting in a nicer display, moving graphics and a lot of irritating delays: see the Benchmarks for comparisons. If you need to see the screen continuously then SLOW mode is a boon. If you don't, say if you were doing lots of calculations, then it's better to use the FAST mode. The two can be called from within a program, thus offering the best of both worlds. The SCROLL feature removes the top line from the screen and moves each line up, leaving a blank bottom line. Without SCROLL, the display freezes when the bottom line is reached. A PAUSE instruction is provided which suspends a program's operation for a user-defined period or until a key is depressed. The screen is visible when in PAUSE mode, regardless of whether the program is running FAST or SLOW. In SLOW mode the screen flickers slightly when the PAUSE takes effect but in FAST mode it has to come on altogether. This means that you'll have to be careful not to have your PAUSEs too close together, unless you actually enjoy watching the screen going absolutely bananas. The INKEY$ function is welcome since it can be tested to see if a key is being depressed and, if so, which key it is. This feature is great for fast-moving games since you need only hit the key you're interested in — there's no need to hit NEWLINE.

There are no DATA or READ instructions but this can be circumvented by saving a program with all its associated variables and then using a GOTO to kick the program off when it's reloaded. (RUN automatically clears any variables.) Pressing CONT, not surprisingly, allows you to continue the program. PLOT and UNPLOT functions (0,0 is in the bottom left-hand corner) are provided, giving a graphics capability of 44 by 64 points. Each point, or pixel (picture element), is a quarter the size of a normal character. Hardly high resolution but better than a poke in the eye with a sharp stick!

The cassette needs either 35mm sockets or an appropriate adaptor. SAVE is offered but no VERIFY, so saving a long program can be a bit worrying. I suggest you first save a few short programs, just to make sure the controls are set properly. When loading a program, the pattern on the screen shows you when data is being recognised. The theory of cassette adjustment is that you play a data tape, gradually turning the volume up until the pattern appears. Then you turn it up a little more and it should be ready for use.

The printer, when it arrives, will allow you to LPRINT and LLIST data and programs respectively. Even better, it will allow you to dump the screen contents to the printer using the COPY command either within the program or as an immediate instruction. Such a screen copy takes about 12 seconds to produce.

The only function to disappear is the TL$ command mentioned earlier. The same thing can be accomplished using the LEN and TO instructions. All trigonometric stuff is in radians and PI is provided to help you unravel the results. SGN = signum which can possess one of three values: −1, 0 and +1. At one stage the new ROM (for the ZX80 and, subsequently, for the ZX81) was expected to offer DRAW, UNDRAW, DATA, READ and RESTORE features. Instead I think the idea of adding printing facilities became more important. After all, these features can be realised using the existing range of commands.

A character string of any length may be used as a numeric variable name, providing it starts with a letter. String variable names are restricted to A$ to Z$. String and numeric arrays may be any number of dimensions — the limit is dictated by the amount of free memory available. String arrays are character arrays really, with the last entry in a DIM statement being the number of characters per array element. With a full 16k RAM and a small program (it fitted on the screen) I set up a string array 100 x 6 x 25 characters long. I used this since each element would be about the size of a name and address record, allowing extra information like telephone number and birthday, for example. Substrings are handled using the TO function. LET A$=B$ (3 TO 5) would make A$ a three character string comprising the third to fifth characters of string B$. This open up possibilities for giant strings and the use of string slicing to extract variable length fields.

Documentation

A programming book is provided with the system: *ZX81 Basic Programming* by Steven Vickers. The cover is a very odd photo (montage?) of what appears to be a couple of model delta-wing jets on top of a solitary skyscraper at night. Two red windows peer at you from the upper floors. It must be full of deep meaning which totally escapes me. Sinclair Research specially commissioned it. Can any psychologist readers tell us what it's all about, please?

Technical Specification

CPU:	NEC Z80A, 3.5 MHz
Memory:	1k RAM expandable to 16k
Keyboard:	Plastic membrane under-surface printed
Screen:	Domestic UHF television
Cassette:	Domestic audio recorder
Firmware:	8k ROM containing Basic and operating system

Binary Operations

\+ − * / ** = > < <= >= <>

Statements (all except INPUT may be used as commands)

CLEAR	CLS	CONT	COPY	DIM	FAST	FOR..TO..(STEP)	GOSUB
GOTO	IF..THEN		INPUT	LET	LIST	LLIST	LOAD	LPRINT
NEW	NEXT		PAUSE	PLOT	POKE	PRINT (TAB)	(AT)
RAND	REM	RETURN		RUN	SAVE	SCROLL	SLOW
STOP	UNPLOT						

Functions

ABS	ACS	AND	ASN	ATN	CHR$	CODE	COS	EXP	INKEY$
INT	LEN	LN	NOT	OR	PEEK	PI	RND	SGN	SIN
SQR	STR$	TAN	USR	VAL					

Benchmark Timings (in seconds)

	Slow	Fast	ZX80
BM1	17.7	4.5	1.5
BM2	27.2	6.9	4.7
BM3	65.3	16.4	9.2
BM4	63.0	15.8	9.0
BM5	74.2	18.6	12.7
BM6	199.3	49.7	25.9
BM7	275.6	68.5	39.2
BM8	91.6	22.9	couldn't be done

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*requires a 48K, 16-sector disk based APPLE II system

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CIRCLE 230 ON READER SERVICE CARD

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ZX 81, continued...

The book is written for the novice, and it does a pretty reasonable job. It is infinitely better than the book given out with the ZX80. What a pity, then, that just as the reader is about to key something in for the first time, he encounters the most off-putting (and unnecessary) paragraph in the whole book: 'A message like this, telling the computer to do something straight away, is a command; this particular one is a PRINT command, but also a PRINT statement. Calling it a PRINT statement just specifies its form without referring to how the computer is going to use it. Thus every command takes the form of a statement, but so do some other things — program lines do, as we shall see in Chapter 8.'

The style of the book isn't really to my taste although Steven reveals a lot about himself with his talk of dead tax collectors and expressions like 'Lor', love a duck'. *Eye* fans will be delighted with his reference to *Talbot?* on page 38 (I find the question-mark rather becoming, don't you?). Oddly, error codes are referred to as report codes. Perhaps the idea of associating errors with the machine was just too abhorrent, even if they do happen and even If they are usually the user's fault. Ho hum — more psychologist fodder. There are the usual typographical errors which didn't get cleared up but I couldn't find too many. The only other thing in the manual which actually troubled me was the reference to pounds, shillings and pence in one programming example. My kids (aged ten, eight and six months) didn't know what it was all about and, let's face it, a lot of these machines are going to be bought by, and for, kids.

Potential use

Who would use this machine? Kids will love it (so will Dads) and, at this price, I can't think of a better way of introducing them to the subject. Most courses on computers and especially on Basic programming cost more than the ZX81. In my view you can buy a ZX81, have a lot of fun, learn a bit about computers and Basic programming and decide whether you like it or not. If you don't like it or if you decide to move on to bigger and better things, you can always sell the machine (or give it to ComputerTown). The 16k RAM pack is a must for anyone doing anything remotely serious. The printer, when it arrives, will give you the chance to keep a record of all that interesting stuff you've got locked in the machine. The floating point arithmetic certainly makes the ZX81 a far more useful machine than the ZX80 and I suspect that many people will give it serious consideration as a result. You must bear in mind the sort of limitations imposed by the ZX81's inability to handle files. You can save a program with all its variables on tape, which gives you 16k for both programs and data. In my earlier example, I managed to get 100 records of 150 characters each into memory with a short program of 20 lines or so. There's no reason why you shouldn't record the program again with another 100 records, which would overcome this particular limitation. The only problem you'd be left with, then, is the fact that other programs cannot access the same data. I think that if you're really worrying about this sort of thing then maybe you require a more substantial system.

Expansion possibilities for the ZX81 are limited at the moment to the printer and the 16k RAM pack. I asked Clive Sinclair if there was any chance of disks being developed and he gave the same enigmatic answer he gave a year ago when I asked the same question about the ZX80: 'We're working on it.' Draw your own conclusions.

Conclusions

He's done it again. Uncle Clive has come up with a lovely product which will have enormous appeal to people wanting to find out more about computers, but without it costing them an arm and a leg. The idea of producing a superior machine to the ZX80 and selling it for a lower price is absolutely wonderful. I'm full of admiration for the man. Most people would have upped the spec and held the price ('It really hurts me to do this') or even increased it slightly. The product is clearly aimed at the home market and I'm sure that it will do extremely well there, far better in fact than the ZX80. And *that's* rapidly becoming the biggest selling micro in the world!

People who are wondering about its relevance to business or serious work at home ought to sit down and do a few calculations on just how much information they need to hold and how they wish to access it. You could hold 100 or so names and addresses or keep track of around 600 financial transactions in one load of the 16k memory. These figures allow for a fairly simple entry and enquiry program in each case. By abbreviating information you can clearly cram more in. By splitting your information across several tapes you can build a substantial file of information but each tape would have to be managed by a separate version of the program.

If you know nothing about computers and you want to enjoy finding out about them, then this machine offers a value for money way of doing just that. Children will love the ZX81, there can be no question about that, and I suspect that more than a few people who are already familiar with computers will buy one, just to have a bit of fun. □

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CIRCLE 166 ON READER SERVICE CARD

Authoring Systems for the Apple

creative computing SOFTWARE evaluation

David Lubar

Recognizing that many teachers aren't satisfied with the limited flexibility of many of the available software packages, and that most teachers don't have time to develop their own programs, several companies have produced authoring systems. This is a rather fascinating concept: the programs are designed to write programs. We recently received four authoring systems for the Apple. The crucial factors in evaluating them were ease of use, flexibility, and quality of the end product. On these and other criteria, the programs ranged from good to abominable.

Zenith Educational System

The Zenith Educational System (no relation to Heath/Zenith), is highly flexible but, as a result of this, complicated to use. In essence, the user builds lessons from modules, combining text pages, graphs, and graphics. For each question in a test, up to four possible answers are allowed. In other words the teacher can enter a question such as "If you had three pencils and gave two away and lost one, how many would you have?" and enter as correct answers "0," "zero," "none," and "nothing." Graphics can be tied into any frame of a lesson, and animated sequences can be set up, adding life to lessons. The program also allows the teacher to enter a hint for each question, and a response for correct answers.

Another feature of the Z.E.S. system is revision questions. These are inserted between regular questions, and are only asked if the student fails on the regular question. Incorrect answers to revision questions cause the program to print a message telling the student to call the teacher. The teacher has the option to continue or terminate the session. There are also automatic questions which are similar to revision questions except that they don't cause the program to halt.

creative computing SOFTWARE PROFILE

Name: Zenith Education System
Type: Authoring System
System: 48K Apple, Applesoft, Disk drive
Format: 3 Disks
Language: Basic
Summary: Complex, but versatile
Price: $250
Manufacturer:
Avant-Garde Creations
P.O. Box 30160
Eugene, OR 97403

The graphics disk contains a selection of pre-defined shapes, and a program for creating shapes. Once shapes are created, they can be used in frames of the lesson. As a bonus, the flip side of the graphics disk contains a program that quickly initializes multi-boot disks.

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For insight into some of the basic principles underlying **ISAAC NEWTON** see GODEL, ESCHER, BACH by Douglas R. Hofstadter, Chapter XIX and Martin Gardner's MATHEMATICAL GAMES column in **Scientific American,** October, 1977 and June, 1959 $24.95.

TIME TRAVELER

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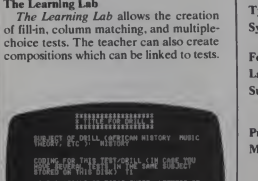
Authoring Systems, continued...

As mentioned, there is a price for this flexibility. The user can't just sit down and create a lesson. Modules have to be designed part by part. Different disks are required for creating text and graphics. The user must cope with a program disk, a module disk, and a graphics disk, doing a fair amount of disk swapping during the creation of a program. Even if the user has a dual-drive system, he must still use drive one for almost everything.

In essence, the Z.E.S. system allows teachers to create useful programs, but demands planning and effort on the part of the teacher/author.

The Learning Lab

The Learning Lab allows the creation of fill-in, column matching, and multiple-choice tests. The teacher can also create compositions which can be linked to tests.


TITLE FOR DRILL ?
SUBJECT OF DRILL (AMERICAN HISTORY, MUSIC
READING, ETC.)? HISTORY
CODING FOR THIS TEST/DRILL (IN CASE YOU
HAVE MORE THAN ONE IN THE SAME SUBJECT
STORED ON THIS DISK) ? 1
YOUR INITIALS OR FIRST THREE LETTERS OF
LAST NAME (IN CASE MORE THAN ONE PERSON
IS USING THIS DISK) ? DAL
KIND OF DRILL (FILL-IN, COLUMN MATCH
OR MULTIPLE CHOICE)? FILL
YOU NEED NOT USE ALL AVAILABLE SPACES

These compositions are used to provide background on the questions in the test. This system also uses several disks, but takes advantage of a second drive if present. The Master Disk is the entry point for creating tests and viewing student scores. Tests are stored on another disk, and student records kept on a third.

The fill-in test format allows a question, a preferred and alternate answer, and one hint. Column-matching allows ten pairs of phrases and two unmatched phrases for padding out the answer column. Multiple choice allows five answers, the fourth and fifth of which can be "all of the above" and "none of the above."

creative computing
SOFTWARE PROFILE

Name: The Learning Lab

Type: Authoring System

System: 48K Apple, Applesoft, Disk Drive

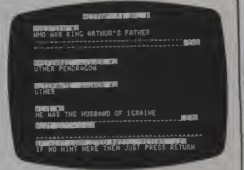
Format: 2 Disks

Language: Basic

Summary: Constructs fill-in, multiple-choice, and column-matching tests.

Price: $150

Manufacturer:
Micro Lab
2310 Skokie Valley Rd.
Highland Park, IL 60035



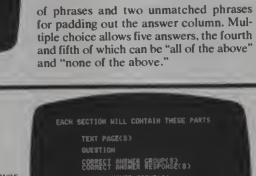
Once a test is created, the student can take it in either test or instruction mode. The instruction mode first presents a composition, if one exists for this test, then gives the student several chances to answer the questions, greeting right and wrong answers with canned comments. These comments may not appeal to everyone, but they are part of the program and cannot be changed.

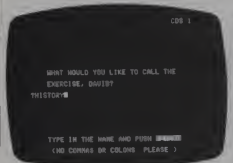
The Learning Lab keeps track of student scores, storing the information on a separate disk. It can also give the teacher statistics about a test, such as the number of times a test was taken, the average score, and the number of questions in the test.

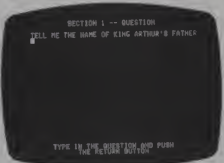
There seems to be one slight bug in the tests. The one we created crashed if the student hit the right arrow followed by return; perhaps the error traps need a bit of work. Aside from this problem and the canned comments, *The Learning Lab* could be fairly useful in a classroom.

Bell & Howell Courseware Development System

Courseware Development System I was the easiest system to use and, though fairly fixed in the format of tests, allowed a surprising amount of flexibility. The system could be used with almost no reference to the documentation. The system is on







creative computing
SOFTWARE PROFILE

Name: Courseware Development Systems I

Type: Authoring System

System: 48K Bell & Howell computer or Apple with Applesoft, Disk Drive

Format: Disk

Language: Basic

Summary: Easy to use

Price: $300

Manufacturer:
Bell & Howell
Audio-Visual Division
Dept. 8876, 7100 McCormick Rd.
Chicago, IL 60645

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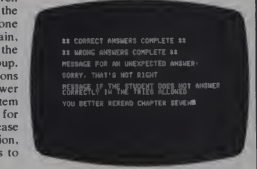
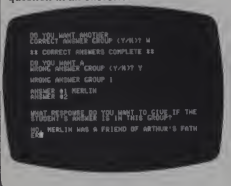
Authoring Systems, continued...

one disk, and tests are stored on other disks. Each exercise is made up of units that begin with one or more text pages. The teacher doesn't have to worry about formatting the text; wraparound is automatically avoided during presentation of the test. The text pages, which are optional, can contain background information, lessons, or whatever else the teacher desires. Next comes the question, followed by the first correct-answer group. There can be several correct-answer groups. For each group, the teacher can specify a response to be given if the answer given by the student matches a member of the group. Next, the teacher can specify one or more wrong-answer groups. Again, responses can be entered for when the student matches a member of the group. This could be very useful for questions that many students are likely to answer with specific incorrect replies. The system next asks for a comment to be given for unexpected answers, a message in case the student fails to answer the question, and for any hints the teacher wishes to supply.

CORRECT ANSWER GROUP 1
ANSWER #1 EITHER PENDRAGON
ANSWER #2 UTHER
WHAT RESPONSE DO YOU WANT TO GIVE IF THE STUDENT'S ANSWER IS IN THIS GROUP?
VERY WELL DONE!


CORRECT ANSWERS COMPLETE
WRONG ANSWERS COMPLETE
MESSAGE FOR AN UNEXPECTED ANSWER:
SORRY. THAT'S NOT RIGHT
MESSAGE IF THE STUDENT DOES NOT ANSWER CORRECTLY IN THE TRIES ALLOWED
YOU BETTER REREAD CHAPTER SEVEN

This process continues for as many units as the teacher requires. The test is now ready to use. Earlier, at creation time, the teacher specifies how many incorrect answers should be allowed before the program presents the failure message. Now the teacher has the option of opening the test to all students or creating a roster. If a roster is used, student records are kept. The records show the student's scores for a test, and the aggregate results for each question in an exercise.


DO YOU WANT ANOTHER CORRECT ANSWER GROUP (Y/N)? N
CORRECT ANSWERS COMPLETE
DO YOU WANT A WRONG ANSWER GROUP (Y/N)? Y
WRONG ANSWER GROUP 1
ANSWER #1 MERLIN
WHAT RESPONSE DO YOU WANT TO GIVE IF THE STUDENT'S ANSWER IS IN THIS GROUP?
NO, MERLIN WAS A FRIEND OF ARTHUR'S PATH

CDS I earns high marks. As mentioned, it was easy to use, and flexible. By using various combinations of the available entry options, a teacher could produce a good lesson disk.

Eureka Learning System

In an attempt to produce a flexible system, the *Eureka Learning System* forces users into a syntax with all the charm and grace of Cobol. Test material is entered in a bizarre fashion in which the teacher must deal with entities and attributes, producing input that resembles code. This is just a part of the problem. These entities and attributes are organized into sentences, using a numbering system. The entry by the teacher at this point resembles an alphanumeric cryptogram. The end result of all this is that sentences can be presented in various ways with varying syntax. Once the teacher manages to create a quiz, it can be presented in several modes. The Practice mode allows one chance, then supplies the correct answer if the student is wrong. No hint or reinforcement is available. The Evaluate mode presents the questions as a test.

The program allows for graphics and hi-res fonts. No shape utility is provided. Instead, the documentation suggests that the teacher should buy one of the commercially available programs for creating shape tables. This is but one of the absurdities and problems in this package. Rarely have we seen software that has no redeeming qualities. Unfortunately, this is one case where there is nothing good to say. To put it bluntly, we cannot recommend this program to anyone.

Parting Thoughts

At present, authoring systems have the advantage of allowing teachers to create tailor-made software. The disadvantage is that the structure of the created software is still within the drill-and-practice area. While this type of program can be useful, it pales before some of the professionally produced educational programs on the market. Still, a teacher can get a lot of mileage from an authoring system. For a look at another inexpensive, flexible system, see the review of *Aristotle Apple* from Stoneware (*Creative Computing* Oct., 1980, p. 56). □

creative computing SOFTWARE PROFILE

Name: Eureka Learning System
Type: Authoring System
System: 32K Apple, Applesoft, cassette or disk
Format: Tape or Disk
Language: Basic
Summary: Not very good
Price: $995
Manufacturer:
Eiconics, Inc.
200 Cruz Alta
Taos, NM 87571

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Applesoft Compilers:
A Comparative Evaluation

Helmar Herman

Many Apple owners have waited with great anticipation for an Applesoft Basic compiler. Now, within a span of a few months, four companies have released Applesoft compilers.

Why this interest in Applesoft compilers? And what is an Applesoft compiler anyway?

To understand what a compiler is, and what it can do for you, you must first understand how your Applesoft Basic works.

Interpreter

Applesoft is an interpretive language. Each time a Basic statement is to be executed by Applesoft, Applesoft must re-examine the statement to determine what to do. (Please refer to the sample program in Listing 1.)

```
10 INPUT 'ENTER A NUMBER';NUM
20 PRINT SQR(NUM)
30 GOTO 10
```

Listing 1. Sample Applesoft program.

Every time the program logic goes to a new line, Applesoft must examine the statement. For example, in line 10, Applesoft must determine that it is an INPUT request, that ENTER A NUMBER is to be displayed prior to prompting the operator, and that the response is to be placed in NUM.

When a number is entered, Applesoft will then examine statement 20 and perform the specified action (PRINT). Applesoft will then examine the next statement, 30, and perform the GOTO request.

Whenever a new line is encountered, Applesoft must re-examine the line as though it has never seen it before. It is because of this constant re-examination of statements that interpretive languages are slow.

Another problem with interpretive languages is that whenever program control is to transfer to a new statement (statement 30), Applesoft must spend time looking for the statement to which transfer is to be made. In a large program, this can take a considerable amount of time.

Compiler

A compiler transforms the Basic program into a machine language program. Each statement is examined by the compiler and is converted (compiled) into machine language instructions that perform the specified action.

When the program is run, the compiled machine language program is executed directly by the hardware, without a software interpreter having to examine each line.

When program control is to be transferred to a new statement, the address of the new statement is compiled into the machine language program, thus eliminating the need to search for the statement to which transfer is to be made.

Advantages and Disadvantages

There are various trade-offs with interpreters and compilers. See Figure 1 for a list.

In general, interpreters are much better when developing programs because of the ease and speed of program modification and debugging. Compilers are better when the program is ready for production work because of the speed advantage.

Four Systems Examined

The four systems being examined are Expediter II from On-line Systems, TASC from Microsoft Inc., Applesoft Compiler from Hayden Publications, and Speed Star from Southwestern Data Systems.

In examining these systems, important items to look for are:

1. *Accuracy*. The compiled programs should run *exactly* as the interpreted programs do.
2. *Compatibility*. All functions of the Applesoft interpreter should be supported.
3. *Program Optimization*. The faster and smaller the compiled program, the better.
4. *Communication*. Compiled programs should be able to pass information to and from other compiled programs.
5. *Program Size*. Compiled programs will normally be larger than the interpreted version. If the compiler generates excessively large programs, its usefulness may be limited.

Item	Interpreter	Compiler
Ease of program development	Here the interpreter is far superior. A change to a program can be made and the results tested in just a few seconds.	Whenever a change is made to a program, the program must be re-compiled before testing can proceed.
Speed	Interpreted programs run relatively slowly.	Compiled programs run relatively fast.
Size	In general, interpreted programs are smaller.	Compiled programs are generally two to three times larger than interpreted programs.
Remarks	Remarks are to be avoided because they make the program larger and slower. On the other hand, programs without remarks are very difficult to modify.	Since remarks are removed during the compilation process, they may be used as needed.

Figure 1. Tradeoffs between interpreters and compilers.

Helmar Herman, Creative Computer Applications, 19 Shadwell Rd., Nashua, NH 03062.

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7-WORLD WAR III- You Atari gamers will have to see this in the Atari version to believe it! If your tired of war games which take 15 minutes a move and have a manual the size of a telephone book; but still want a complex, real-time action war game-this is it! It is designed for two arm-chair generals which may manuever up to 128 seperate type of units at a time. The game displays a map of Iran & Iraq in the first scenario and later on you will find yourself moving nuclear submarines and battleships through two world wars. This is not a boring copy of a board based game but an original war game which takes a lot of skill and may take weeks to play. $29.95/1 disk

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Slightly less important items of interest are:

1. *Speed of Compilation*. Since (in theory) compilation is performed only after the program has been debugged, the program won't be compiled very often. A fast compile is nice, but not a critical factor.

2. *Ease of Use*. The compiler should be easy to use and forgiving in nature. It should be fairly safe to assume, however, that most persons using an Applesoft compiler must be familiar with Applesoft and know how to program.

Also of interest to software authors who may want to market compiled programs is the policy of the compiler company toward distribution of compiled code.

```
5 REM TEST A
10 REM STRING MINIPULATION TEST AND TRY TO CAUSE APPLESOFT ER
20  HOME : INPUT "HIT RETURN TO BEGIN TEST";X$
100  REM  FILL THE STRINGS
105 TEST$ = "A"
110 X$ = "X":Y$ = "X":Z$ = "X"
140  FOR COUNT = 0 TO 250
150 X$ = X$ + "X"
160 Y$ = Y$ + "X"
170 Z$ = Z$ + "X"
175  GOSUB 2000
180  NEXT COUNT
200  REM  FILL ARRAYS WITH THE STRINGS
201  VTAB 12: HTAB 15: PRINT "          ";
205 TEST$ = "B"
210  DIM X$(20),Y$(20),Z$(20)
220  FOR COUNT = 0 TO 19
230 X$(COUNT) = X$
240 Y$(COUNT) = Y$
250 Z$(COUNT) = Z$
255  GOSUB 2000
260  NEXT COUNT
300  REM  STRIP DOWN THE CHARACTERS
301  VTAB 12: HTAB 15: PRINT "          ";
305 TEST$ = "C"
307  FOR COUNT = 1 TO  LEN (X$)  - 1
310 X$ =  LEFT$ (X$, LEN (X$) - 1)
320 Y$ =  LEFT$ (Y$, LEN (Y$) - 1)
330 Z$ =  LEFT$ (Z$, LEN (Z$) - 1)
335  GOSUB 2000
340  NEXT COUNT
1000  PRINT "TEST COMPLETE"
1010  END
2000  REM  ROUTINE TO DISPLAY CURRENT TEST AND COUNT
2010  VTAB,12: HTAB 15
2020  PRINT TEST$,COUNT;
2030  RETURN
```

Listing 2. String manipulation test.

Expected Problems

Programs that call other programs that have been compiled will have to be changed to do a BRUN XXXXXXXX (or BLOAD XXXXXXXX:CALL YYYY) instead of a RUN XXXXXXXX.

Programs that depend on timing loops will have to be modified. For example, suppose a program uses the following statement to pause for a few seconds: 10 FOR X=1 TO 1000:NEXT X. With an interpreted version, this may take 2-3 seconds. With a compiled version, however, it may take only a fraction of a second.

Real-time games will have to be modified to adjust for the speed increase. How would you like it if all of a sudden the balls in your favorite game started whizzing by at five times the speed you're used to?

```
 5 REM TEST B
 10 REM PROGRAM SIZE TEST
 100 A=1
 1010 END
```

Listing 3A. Program size test.

```
 5 REM TEST B
 10 REM PROGRAM SIZE TEST
 100 A=1
 110 B=2
 1010 END
```

Listing 3B. Program size test.

```
5  REM  TEST C
10   REM  TEST OF A BUBBLE SORT
20   HOME : INPUT "HIT RETURN TO BEGIN TEST";X$
30   DIM A(100)
100   REM  FILL THE ARRAY
105  TEST$ = "A"
110   FOR COUNT = 1 TO 100
120  A(COUNT) = 101 - COUNT
125   GOSUB 2000
130   NEXT COUNT
200   REM  SORT THE ARRAY
201   VTAB 12: HTAB 15: PRINT "          ";
205  TEST$ = "B"
210   FOR X = 99 TO 1 STEP  - 1
215  COUNT = X: GOSUB 2000
220   FOR Y = 1 TO X
230   IF A(Y)  > A(Y + 1) THEN 270
240  A = A(Y)
250  A(Y) = A(Y + 1)
260  A(Y + 1) = A
270   NEXT Y
280   NEXT X
1000   PRINT "TEST COMPLETE"
1010   END
2000   REM  ROUTINE TO DISPLAY CURRENT TEST AND COUNT
2010   VTAB 12: HTAB 15
2020   PRINT TEST$,COUNT;
2030   RETURN
```

Listing 4. Bubble sort test.

```
5 REM TEST D
10   REM  SPEED TEST FOR HEAVY DISK I/O PROGRAM
20   HOME : INPUT "HIT RETURN TO BEGIN TEST";A$
30  D$ = CHR$ (4)
40  TEST$ = "A"
100   REM  OUTPUT THE FILE
110   PRINT D$;"OPEN TESTFILE,D1"
150   FOR COUNT = 1 TO 100
170   PRINT D$;"WRITE TESTFILE"
180   PRINT "THIS IS THE SAMPLE RECORD";COUNT
190   GOSUB 2000
200   NEXT COUNT
210   PRINT D$;"CLOSE TESTFILE"
220   REM  READ THE FILE BACK
230  TEST$ = "B"
240   PRINT D$;"OPEN TESTFILE"
250   FOR CCOUNT = 100 TO 1 STEP  - 1
260   PRINT D$;"READ TESTFILE"
270   INPUT Z$,CCOUNT
280   GOSUB 2000
290   NEXT CCOUNT
300   PRINT D$;"CLOSE TESTFILE"
3000   PRINT "TEST COMPLETE"
3010   END
4000   REM  ROUTINE TO DISPLAY CURRENT TEST AND COUNT
4005   PRINT D$
4007   VTAB 12: HTAB 17: PRINT "       ";
4010   VTAB 12: HTAB 15
4020   PRINT TEST$,COUNT
4030   RETURN
```

Listing 5. Speed test for heavy disk I/O program.

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The Tests

Test A (Listing 2) is a string manipulation test. Being tested is the speed of the compiled version and its vulnerability to Applesoft frees. Since string manipulation requires a fair amount of work by the computer, I would expect a significant time improvement in this test. An Applesoft free, by the way, is a problem that arises in large programs that do a great deal of string manipulation. As the area reserved for strings fills up, Applesoft periodically condenses the strings (also called garbage collection) to free up room at the end for more strings.

Test B (Listings 3A and 3B) is a test to see how large a single statement program is and how much it grows by adding one simple statement. Listing 3A will show you how much overhead each program will have. To this overflow you then add the amount of storage taken by each compiled program statement. The lower the overhead, the better.

Test C (Listing 4) is a general speed test. It uses a bubble sort (one of the slowest) to test the speed of a logic-bound program.

Test D (Listing 5) tests the speed of a heavy disk I/O program. I expect that compiled programs will run at about the same speed as interpretive programs.

See Figure 2 for the results of the tests.

TEST	LENGTH	SPEED (C1)	(C2)	
A(I)	717	23	••	Listing 2.
A(O)	3465	30!	33	
A(M)	4797	13	98	
A(H)	2500	(*1)	14	
A(S)	3222	17	1	
B(I)	38	••	••	Listing 3A.
B(O)	2362	••	11	
B(M)	4028	••	62	
B(H)	376	••	10	
B(S)	2101	••	1	
B(I)	46	••	••	Listing 3B.
B(O)	2384	••	11	
B(M)	4048	••	62	
B(H)	395	••	10	
B(S)	2124	••	1	
C(I)	464	124	••	Listing 4.
C(O)	2964	27	23	
C(M)	5049	40	94	
C(H)	2622	24	15	
C(S)	3070	53	1	
D(I)	594	36	••	Listing 5.
D(O)	3275	32	27	
D(M)	4642	30	94	
D(H)	1937	30	13	
D(S)	2730	30	1	

The top numbers (I) are the interpreter figures;
(O) are the On-Line compile figures;
(M) are the Microsoft compiler figures;
(H) are the Hayden compiler figures;
(S) are the Southwestern compiler figures.

Note—the compiled lengths for each compiler are calculated differently. Length comparisons may not be completely accurate.

(O) compiled length excludes variables.
(M) compiled length includes variables.
(H) compiled length includes non-string variables.
(S) compiled length includes variables.

(C1) is the program run speed.
(C2) is compilation speed (how long does it take the compile).

*When Listing 2 was compiled and run on the Hayden compiler, an error occurred after the 147th loop of test A. The error was OUT OF MEMORY ERROR IN MODULE $0803. In accordance with a suggestion from the manual, I added the following line the program: 145 X=FRE(0). The program then ran in 15 seconds.

Figure 2. Test results.

Test D (Listing 5) tests the speed of a heavy disk I/O program. I expect that compiled programs will run at about the same speed as interpretive programs.

See Figure 2 for the results of the tests.

All the compilers tested shared the following features:

1. The compilers produce machine language object code that can be loaded and run with the BRUN command.

2. The compiled program can be placed anywhere in memory. Once compiled for a particular place, it can only run there.

3. Figure 3 shows what commands are not supported by which compilers.

4. Special compiler directive commands are supported via REM statements.

5. Compiled programs cannot be interrupted with Ctl-C.

6. They support local or global variables. Global variables allow you to pass information from one compiled program to another (but not from an un-compiled program to a compiled one).

7. Once started, the compilers can only be interrupted with the Reset key.

Expediter II

Expediter II comes with two disks. One for DOS 3.2, and the other for DOS 3.3. The disks are copy protected.

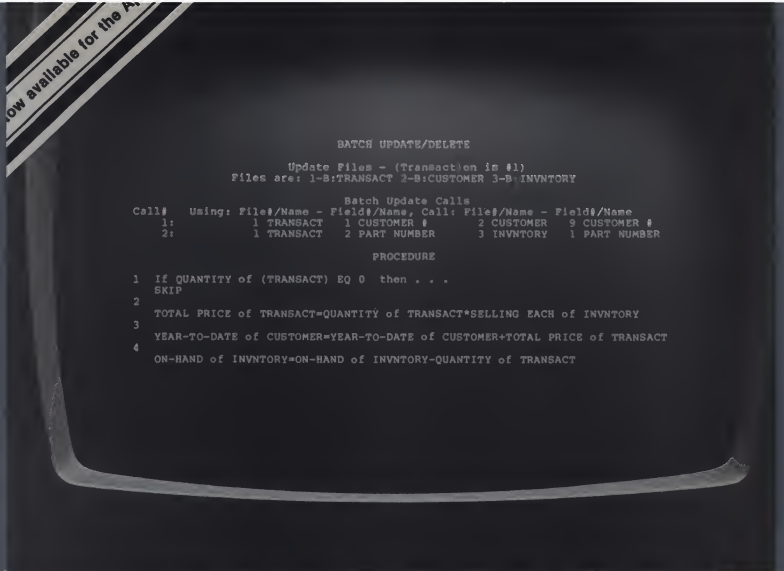
Rather than just producing a machine language program which is then BRUN, the compiler produces a one statement Applesoft program. The one statement is usually 1 CALL 4352. The machine language portion of the program is attached to this single line Basic program. You can thus SAVE, LOAD, and RUN the program exactly as you would any other Basic program.

If you *must* have a BLOADable version of the compiled code, there are instructions on how to accomplish this.

You can also leave "holes" in your compiled code to provide room for such things as the hi-res areas.

One potentially difficult problem is in the method used for string manipulation. Applesoft treats all strings as variable length strings. Thus a 5-byte string and a 60-byte string would take 65 bytes (plus overhead). Expediter treats all strings as fixed length strings. Before compilation you must specify how long the strings are to be. All strings will then be that length. Thus a 5-byte string would still occupy 60 bytes (or whatever string length was specified).

ow available for the A


BATCH UPDATE/DELETE
Update Files - (Transaction is #1)
Files are: 1-B:TRANSACT 2-B:CUSTOMER 3-B:INVNTORY
Batch Update Calls
Call# Using: File#/Name - Field#/Name, Call: File#/Name - Field#/Name
1: 1 TRANSACT 1 CUSTOMER # 2 CUSTOMER 9 CUSTOMER #
2: 1 TRANSACT 2 PART NUMBER 3 INVNTORY 1 PART NUMBER
PROCEDURE
1 If QUANTITY of (TRANSACT) EQ 0 then . . .
SKIP
2
TOTAL PRICE of TRANSACT=QUANTITY of TRANSACT*SELLING EACH of INVNTORY
3
YEAR-TO-DATE of CUSTOMER=YEAR-TO-DATE of CUSTOMER+TOTAL PRICE of TRANSACT
4
ON-HAND of INVNTORY=ON-HAND of INVNTORY-QUANTITY of TRANSACT

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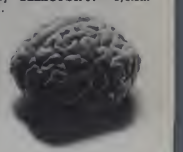

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The good part of this is that there is never any garbage collection. Also, in theory, string operations should be faster. In practice, however, they appear to be slower.

The bad part is that if you have many strings, they must all be as long as the longest one, which may cause a storage problem.

Worse, is that you are not notified if you exceed a string length. The program just keeps on running, wiping out who knows what variables until eventually something vital is destroyed and the program fails.

There is an unusual restriction with this system. All arrays must be defined in the program *physically* ahead of the first use rather than *logically* ahead of the first use. Thus the following program is invalid:

```
10 GOSUB 100
20 A(20)=5
30 END
100 DIM A(20)
110 RETURN
```

The DIM statement at 100 must physically precede the first use at statement 20 even though statement 100 will be executed before statement 20.

Because of this restriction, and because of the common practice of placing DIM statements at the end of programs (for speed), inexperienced users may have trouble with Expediter when compiling off-the-shelf programs.

As far as speed and length of programs, the Expediter sits comfortably between the extremes produced by the tests, though it created the slowest code for the string program. On the other hand it has the fewest unsupported Basic statements of any of the compilers tested.

An annual charge of five times the list price is charged for distribution of compiled code.

On-line Systems, 36575 Mudge Ranch Rd., Coarsegold, CA 93614. $99.

TASC (The AppleSoft Compiler)

The version of TASC that I tested was a pre-release Beta test version, and all test results should be viewed in that light.

TASC is distributed on a DOS 3.2 disk. It can be muffin'd to produce a DOS 3.3 version. The disk I have is not copy protected, and Microsoft has indicated that they have not yet decided whether or not they will copy protect the final production version.

TASC was written in Basic and then used to compile itself—a very intriguing concept.

The output from TASC is a relatively small BLOADable file. The size of the object program is deceptive, however, because in order to run the program, you must first BLOAD the file RUNTIME. RUNTIME contains execution time subroutines which are called by your compiled program. It is approximately 4K long.

It is a slight inconvenience to have to BLOAD RUNTIME every time you want to run a compiled program. On the other hand, the amount of disk space required for each program is reduced.

For frequently used programs, you can simply write an Applesoft program that BLOADs the runtime package and then BRUNs your compiled program.

Unlike the other compilers, TASC can be gracefully interrupted while compiling.

Whenever the program pauses for user information, such as program name, you can enter DOS command by prefixing the response with a Ctl-D.

TASC fared worst in compilation speed, but did reasonably well in execution time. While the runtime routines take a fair chunk of space, the compactness of the compiled code could make up for this in long programs. TASC had more unsupported statements than any of the other compilers.

Unsupported Statement	On-line	Microsoft	Hayden	Southwestern
CONT	U	U	S	U
DEF FN	S	*	*	S
DEL	U	U	U	U
HIMEM	U	S	S	S
IF X$ THEN	S	***	S	S
LIST	U	U	U	U
LOAD	S	U	U	U
LOMEM	U	U	S	S
NEXT	**	S	S	S
NOTRACE	S	U	U	S
RECALL	U	U	U	U
RESUME	U	S	S	U
SAVE	S	U	U	U
SHLOAD	S	U	U	S
STORE	U	U	U	U
TRACE	S	U	U	S
&	S	U	S	****

U = Unsupported
S = Supported

*DEF FN may be defined, but not re-defined.

**A FOR may have one and only one corresponding NEXT.
The following program would be invalid:

```
10 FOR X=1 TO 10
20 IF X=5 THEN NEXT X:GOTO 40
30 PRINT X:NEXT X
40 END
```

***Strings may not be used as a logical argument.
Statements such as IF A$+B$ THEN 100 are illegal.
Statements such as IF A+B THEN 100 are legal.

****Makes the compiler crash.

Figure 3. Unsupported Applesoft statements.

Microsoft, Inc., 10800 NE Eighth Suite 819, Bellevue, WA 98004. (206) 455-8080. $150.

Hayden Applesoft Compiler

The Hayden compiler is currently available only in 3.2.1 format. Hayden indicates that a 3.3 version is coming and will be shipped free to users who have returned their warranty cards.

Although the disk is not copy protected, the system is shipped with a special "protection device" that must be installed in the game I/O socket.

Hayden was not specific about charges for re-distribution of compiled code. The impression I got was that each request will be handled on an individual basis.

Two extra programs are supplied with the system. The first is the only full color, low-res, single disk copy program I've ever seen. It's quite entertaining. Second is a program to "de-muffin" programs from DOS 3.3 to DOS 3.2. I expect that the second program will disappear on DOS 3.3 versions.

This compiler was the second fastest in compilation and registered favorable execution speeds. On the other hand, each time you want to re-compile a program, you must re-boot! If you are already booted, there is no way to invoke the compiler without booting again. Also, when the compile is done, you must hit the Reset key to exit—a rather strange idea.

The ability to pass data from compiled program to compiled program is limited. All numeric variables must be referenced in the respective programs in exactly the same order. If string variables are shared, then FRE() statements must be inserted into the programs at strategic points.

Like the Microsoft compiler, this one also generates a set of runtime subroutines. These subroutines can either be included in the program or be declared EXTERNAL. If they are external, then they must be BLOADed before execution.

Speed Star

The version of Speed Star that I tested was also a pre-released test version. All test results should be viewed in that light.

Like the Hayden compiler, this one is protected by a device inserted into the game socket. According to Southwestern, the final version will allow you to plug your game paddles into the protection device, thus allowing both to be attached at the same time.

This compiler is lightning fast. The test compiles were done almost instantaneously. Also, repeat compiles are quick because you don't have to reload the compiler each time. However, comparative execution speed varied considerably from test to test. The compiler locates itself at location X'7200' and is invoked with the "8" key.

The address at which Speed Star runs is HIMEM for a 32K system. Unfortunately, it still loads there on a 48K system. The extra 16K does not appear to be useable during the compile process, thus limiting the size of your program.

One nice feature is the ability to include Ctl-C checking logic in the object program automatically. Also, you can have the system check subscripting ranges. These checks, of course, do not come free. They result in a decrease in storage and a slight speed degradation.

There are many times when a significant speed increase can be accomplished just by having one or two Applesoft sub-routines converted to machine language and leaving the rest of the program interpretive. This was the only compiler that allowed interpreter programs to call and pass variables to and receive variables from compiled programs. Although I didn't actually try this feature, it seemed fairly simple, based on the documentation.

Southwestern Data Systems, P.O. Box 582-S, Santee, CA 920071 (714) 562-3670. $85 (introductory price).

Conclusions

I ran one other test on all four of the compilers in which I tried to compile the menu program from The CCA Data Management System. The program works perfectly in interpretive mode. After compiling, I got the following results:

Microsoft: It worked for a while. I was able to define the system configuration, but then it crashed into the monitor.

Online: The screen went blank and then nothing.

Hayden: The menu was displayed, but whenever I tried to enter a number for a valid function, the system beeped and rejected it. Then when I entered an invalid function, the program got an Applesoft error.

Southwestern: The configuration portion ran, but instead of displaying the menu, the program terminated.

Just as an educated guess, I suspect that the compilers are having trouble with the ONERR routines.

I recompiled with the Microsoft compiler and specified inclusion of the RESUME logic. The program worked much better and operated correctly with one minor exception.

At about this time, Microsoft sent me some fixes to their compiler, and wonder of wonders, the problem was solved. The menu now worked perfectly.

I was encouraged by this and tried compiling the SORT portion of the system. A dramatic success. The compiled program ran perfectly and was substantially faster than the interpretive program. I did have to modify the program to change the dynamically dimensioned arrays to statically dimensioned arrays.

The above experience illustrates my concluding statements and conclusions:

The larger and more complex a program is, the less likely it will compile successfully without modification (for example, dynamic arrays).

For one reason or another, off-the-shelf programs will probably not compile successfully without modification and effort.

Recommendation

Before I applied the patches to the Microsoft compiler, I was not ready to recommend any of the compilers.

After running the fixed program, however, the Microsoft compiler would be my recommendation. Although it is by far the slowest, the programs it compiles seem more likely to run successfully. It appears that once again, the tortoise has beaten the hares!

If you have programs that are too large to compile, you may want to consider the Southwestern compiler. It is the only one to support the compilation of subroutines with full data transfer capabilities. As was evidenced with the CCA DMS main menu, however, you may have to fiddle with your program to get it to work. □

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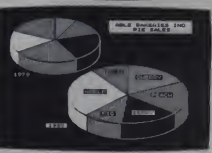

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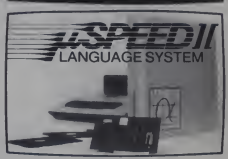

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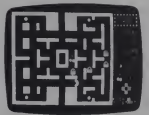

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HEATH

ASSEMBLY LANGUAGE PROGRAMMING

A Continuing Education Course

Greg Greene

I have a friend by the name of Jack Brown. Jack is a software type, that is, he would rather work on problems in software than problems in hardware. "Nothing special about that," you may say, "after all, don't we all have the same affliction? Do we not all pursue the ultimate program? Do we not expound upon the virtues of Basic vs Pascal vs Fortran?"

Each unit has quick 'self-tests' at appropriate places, and an exam at the end.

Well yes we do, but Jack is not content to do things the "easy" way. Jack would rather do it in assembly language. His enthusiasm for bits and bytes knows no bounds and his never-ending zeal to gather converts to his cause brought me to the realization that there must be something to this mysterious way of programming. Therefore I set upon the path of knowledge in search of enlightenment.

Greg Greene, 207-885 Craigflower Rd., Victoria, B.C. Canada V9A 2X4.

It is one thing to seek knowledge, and quite another to gain it. In search of a course of action which would enable me to learn, I looked at several books on assembly language programming for the 8080 microprocessor which my H-8 uses. I found there were quite a few books which explained the instruction set, but few which would enable me to learn how to program. What I needed was something that would give me experience in a controlled fashion so that I could actually do something, rather than just read it from a book. Alas, none of the books could penetrate my thick skull and deposit their knowledge therein.

At this point I noticed that the Heath Company was putting out a home study course in assembly language programming to complement their course in Basic. At the same time I also heard from several friends who had purchased the course that it was not all that good. My friends complained that there were many errors in the printing, and that the course was not organized very well. Also, I was told, the programs presented would not run as they were written on the H-8.

Therefore, I did not buy the course until a local store had it on sale and my continuing search for an alternative had proved fruitless.

The first thing I noticed about "Assembly Language Programming, a Continuing Education Course" was that it was written in an easy, conversational style. Author Willard Nico assumes that the reader knows little of assembly language programming and starts from there. This, for me, was exactly the case. The author also takes the trouble to tell those who have had some experience why he takes this approach. Thus, I believe that even those with experience will not be put off by the way the course is presented. Indeed, they should find it refreshing and a helpful brush-up on some points they may have been overlooking. The introduction clearly states, as all instructional material should, the objectives of the course and the method of achieving them.

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Language Course, continued...

There are ten sections, or units, in the course. They start with an explanation of what digital computers are, and what they can do. The course proceeds from the basics of input/output in the beginning units, to the completion of a program that emulates the instructions of the 8080 and shows how each affects the various registers and flags.

This program is called Wise and is worth the price of the course. Each unit has quick "self-tests" at appropriate places, and an exam at the end. Also included is a separate workbook that acts as a test to see if you have absorbed the information, and little drills that require you to write sections of the program by yourself. This technique, together with the introduction of new instructions as they become useful to the program ensure that you progress in a controlled manner. Let's take a look at the units and see what they offer and how they offer it.

First, let me note that there are two appendices, one is a copy of the Heath assembler book, which lists all the mnemonics and the instruction set. The other is a lesson on number sets. You will be directed to these at appropriate spots in the course.

Unit one covers some common definitions which would be new to the novice computerist. These include such things as RAM, ROM, RWM, and a lesson on how to express numbers in binary or hex and convert between them and decimal. This unit also discusses the various registers and flags of the 8080.

Unit two introduces you to programming, explaining what an assembler does, use of the IN, OUT, HLT, JMP, JZ, ANI and MOV instructions. This section shows how, in a typical 8-bit computer, IN and OUT operations are accomplished. These are the basic 'building blocks' of all the programs included in the course.

Unit three introduces such terms as "assembler directives," "source code," "parity," and "stacks." The directives covered are ORG, EQU, END, DB, DS and '*.' New instructions introduced are INX, CPI, JNZ, MVI, DCR, CALL and RET. The section also provides a tour of a typical memory map so you can figure out where to originate your first program. The program you are invited to try is called, "Type My Name Ten Times." You are led through the development of the program, and it is clearly explained why the particular instructions are used.

I think the best way to describe the feeling I had is to ask you to remember how it was when you got your first program—in any language—to run correctly.

At the end of the unit you are invited to try the program on your own computer. I did, and it wouldn't work. The author warns you this might happen, and explains why. I simply followed the directions of the workbook and presto! I had my first assembly language program. I think the best way to describe the feeling I had is to ask you to remember how it was when you got your first program—in any language—to run correctly. I have to admit that making the changes necessary to get it to run on the H-8 taught me a great deal, and that is what I wanted.

Units four, five and six take you through another program, "All Base Conversion," which converts hex to octal, split-octal, decimal and binary. The author uses this program as an example of how to use new instructions and different techniques. Unit six wraps it up with methods for de-bugging and little tricks to make the program run quicker and use less space. Since the conversion program uses different number systems, you learn them also. The author stresses throughout the course, that there are many ways to accomplish the same end and even if yours may take a different route, as long as it gets there it's OK. I found his constant urging to "try it alone" to be just what I needed. My All Base Conversion may not be as short as the author's, but it works!

Units seven to ten, bring you to the Wise program and show you how to use it. Along the way you learn additional instructions and ways to give your programs that professional touch. I must say that despite the clear style and explanations given in the earlier units, I would have understood the various instructions better had I been able to use the Wise program at the start. But you have to walk before you can run, and in a course like this you can always start over if you want. Each time you do, things become a little clearer and you understand a little more.

When you feel that you have it all down pat, you can take the final exam and mail it back to Heath. This is optional, but if you're like me, you'll want that certificate as a mark of your achievement.

A word to the wise: in this course, as in all others, you get out of it only what you put in. So do not skip any of the questions on the self-tests or exams. If you cannot answer them, you have not yet absorbed the material. Go back and try again. If you are really stuck, the answers are all included, but if you have to peek at the answer, make a point of going back and ensuring that you really understand what's going on. Since each unit builds on the information in the previous ones, you will only get further behind if you try to go too fast. I had to go back many times on some of the parts, but I attribute this to the thickness of my skull, rather than to any fault of the course.

Some of the criticisms cited above are valid. There are some mistakes in this book that should not be there. For instance, all of the answer choices for some questions are incorrect, and only the answer sheet has the right one. This is unforgivable in any course, as it creates confusion and resentment on the part of the student.

In some cases, the workbook asks questions that are not covered until the next unit, a very aggravating habit.

All of the programs, when adapted to the particular I/O of your computer, will work. Since you take part in the creation of the programs, you learn, and that's what the course is about. Having completed the course I now understand a lot more about how my computer works. Although I can in no way approximate the "Great Canadian Computer Program," I can see beyond Basic, Pascal and Fortran, and the future is bright indeed. $49.

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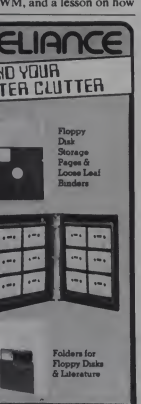
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CIRCLE 263 ON READER SERVICE CARD

Home Financial Decisions for the TI 99/4

Irving Rowe

Until a few weeks ago, I had no interest in computers or in programming. All I knew about computers was that when I got a bill from a store which contained an error, it was devilishly difficult to get it corrected.

All that changed suddenly when I was given a TI 99/4 home computer as a surprise gift. Suddenly I burned with a fervor to utilize it to the hilt and to learn how to program it.

When I looked through the Beginner's Basic manual which came with the machine, I felt sure that I would have no difficulty in learning the language, but it would take me some time to become fluent in it. What to do to get started sooner?

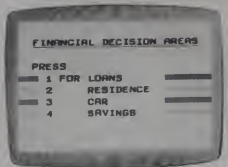
I decided to obtain one of the TI Solid State Software Command Modules so that I could quickly use the computer. The *Home Financial Decisions* module seemed like a good one with which to start, since the calculations that it performed should be useful to everyone.

When I plugged the module into the machine, I found that it took over complete control of the computer. This will probably not surprise any of the readers of this magazine, but at first I was a bit miffed that I could not use any of the Basic commands in combination with the module program.

Nevertheless, I proceeded to investigate what the module could do. I found that *Home Financial Decisions* covers four major areas: Loans, Savings, Residence and Car. Each of these areas has from four to six different programs, for a total of 21 individual programs.

I was not convinced that it would be easier to use than a hand-held calculator.

Some of the programs in the Residence and Car sections involve comparisons of different choices and permit analyses over different periods of time. In order to permit a fair comparison of these different conditions, all of the resulting figures are automatically reduced by the module program to present value, the amount of money which, if invested today at a given rate of interest (either in a savings bank or other type of available investment) would equal the value of a financial transaction at the specified future time.



I must admit that I approached the use of the *Home Financial Decisions* with a certain amount of skepticism. Since this was the first time I was about to use the computer, I was not sure how accurate the results would be, nor was I convinced that it would be easier to use than a hand-held calculator. Several years ago, in my pre-computer days, I had purchased an inexpensive hand calculator, the TI Money Manager, which is pre-programmed to calculate annuity and compound interest

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PRINTER PORT	YES	YES	YES
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Decisions, continued...

problems. I worked out numerical solutions for each of the 21 programs in the *Home Financial Decisions* module and then compared the results obtained by using the Money Manager.

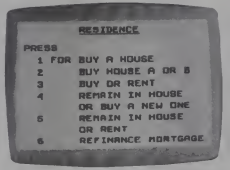
The first four programs in the Loan area of the module yield (a) the amount of money you can borrow at a given interest rate if you specify the size and number of monthly payments you are willing to make; (b) the size of monthly payments required to repay a given loan in a specified number of months; (c) conversely, the number of months required to pay off a loan if you indicate the size of each monthly payment; and (d) the size of the down payment which is needed for a particular purchase if you specify both the size and the number of monthly payments to be made.

I found that I could do the same calculations on my hand-held calculator almost as quickly as with the computer, since these are relatively simple compound interest problems.

The fifth program in this area tells the user how much money is needed to pay off a loan early, before the specified number of payments has been made. This requires two separate operations on the Money Manager, so here the computer clearly has the advantage. Furthermore for each of these programs the computer gave the total amount of interest paid under the indicated conditions. This would have been another operation on the calculator, I obtained the same answers with both devices.

The Savings area of the module solves four problems: (a) how much money will accumulate in a savings account, given the present balance in the account and a given number of regular deposits when the annual interest rate and rate of compounding interest is known; (b) how much must be deposited each year to accumulate a given amount of money in a given length of time; (c) how long it will take to reach a financial goal if the other factors are indicated; and (d) how much money must be deposited in a savings account to permit a regular series of withdrawals to be made before the account is exhausted. The last program is really an annuity calculation. As in the case of the Loan area, these saving programs are very useful, but I could solve the problems quite easily on the Money Manager calculator.

The Residence section of the module gives analyses related to (a) buying a house; (b) the relative costs of buying house A versus house B; (c) the financial advantages of buying a house versus renting one; (d) the comparative cost of remaining in your present house versus buying a new one; (e) the comparative cost of remaining in your present house versus renting a house or apartment; and (f) the cost of refinancing the mortage on your present house.



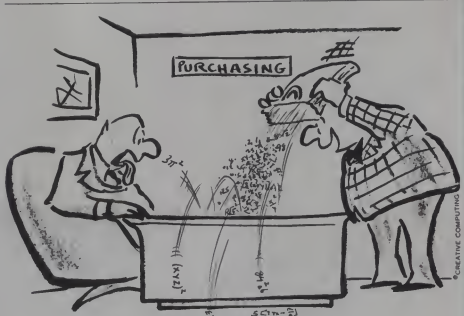
When I first performed one of these analyses and compared the results I obtained on the hand calculator, I found serious discrepancies. I soon discovered that the computer module performed a more sophisticated analysis and took more factors into account than I had considered. For example, the computer module considered not only the cost of the mortgage, but also the cost of utilities, insurance and property taxes. It also takes into account the savings due to income tax deductions for mortgage interest payments and for property taxes. Futhermore it shows the effect of an assumed rate of inflation on the future market value of the house and it indicates the owner's equity in the house at any given time.

The final section of the module deals with the purchase and cost of owning an automobile. As is the case for the Residence area, there are six separate programs: (a) the cost of buying a car (b) comparison of buying car A or car B; (c) a comparison of the cost of leasing versus purchasing a car; (d) a comparison of the cost of keeping your present car versus buying a new one; (e) a comparison of the cost of keeping your present car versus leasing a new one; and (f) the amount needed to pay off the loan early, and the total amount of interest paid up to that point. The last program is identical to the "Early Payoff" in the Loan area of the module.

These programs are about as complicated at those in the Residence group. However, here the programs consider depreciation instead of appreciation. The programs also factor in maintenance costs, insurance and the tax savings due to interest payments. The resale value of the automobile is also considered. These factors cannot be predicted accurately, so to this extent, the results of these analyses are estimates rather than exact calculations.

In summary, I believe the *Home Financial Decisions* module is very valuable if you are interested in the costs of owning or purchasing a house. It is perhaps even more valuable in considering the costs involved in purchasing or leasing an automobile, since this is likely to occur more often. If even a very small fraction of the cost of either of these large expenditures can be saved through these calculations, it will more than pay the $29.95 price of the module. The Loan and Savings program are also useful but they do not provide as clear-cut an advantage over a hand-held calculator, particularly one which has financial functions programmed in. It would be useful for a real estate office where the displays in the Residence section could be used to help customers choose between available houses.

Texas Instruments, P.O. Box 5012, Dallas, TX 75222. □



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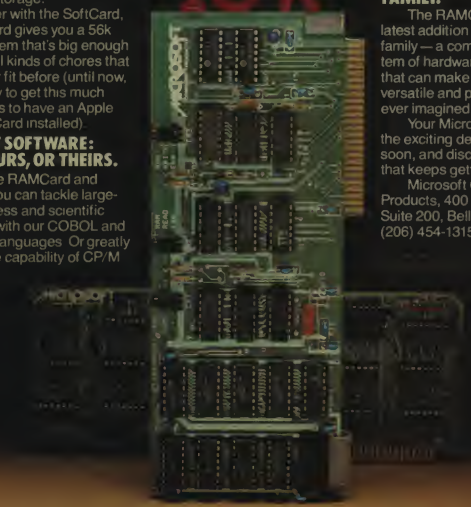

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Monday Night at the Flights

SOFTWARE PROFILE

Name: Computer Air Combat

Type: Strategic Air Combat Simulation

System: 48K Apple II+ or II with Applesoft in ROM, one disk drive

Format: Mixed graphics and text

Language: Applesoft

Summary: Great

Price: $59.95

Manufacturer:
Strategic Simulations, Inc.
450 San Antonio Rd.
Suite 62
Palo Alto, CA 94306

Dale Archibald

My regular Monday night wargaming opponent and I had finished playing a computer game about 10:00. Basking in the warm glow of victory for a change, I decided to unwrap my brand new copy of Computer Air Combat, from Strategic Simulations, Inc. (SSI). I jammed the floppy into the disk drive without even looking at the 18-page 8 1/2" by 11" instruction book, game selection card, map boards, aircraft data cards, or any of the other items in the box. After all, we were experienced computer gamers. Only beginners read instructions.

The screen prompted us to select among multi-player Air Race, solitaire-only V-1 Intercept and Night Fighter, or solitaire/two-player Bomber Intercept, and Dogfight. Since it was late, we decided the V-1 scenario would be best: fast and easy.

We watched the screen and waited for the first V-1 to fly into sight while the lone aircraft flew north forever. My friend left at 10:30 without seeing anything appear, so I grudgingly decided to thumb through the instruction book before I went off to bed. Then I unearthed the game selection card from the assortment of literature in the box. "Eureka," I should have cried.

I finally got to bed about 1:30 a.m. after several unsuccessful V-1 chases. As a writer about computers and games, I have to understand totally how they work, you see. Er, at any rate, I decided to take another little shot at the V-1s after breakfast. Just a few minutes, just to be able to write about the game.

I quit to eat lunch, but didn't turn my Apple II off. In fact, I brought a sandwich to it (first time that's happened). I finally summoned the willpower to shut it down at dinnertime.

It took me the better part of a week to get my mania under control.

By now, you know I like it, of course. SSI and the game designers, Charles Merrow and Jack T. Avery, have come up with a real winner.

Those of you who have played other SSI titles are familiar with the firm's attention to detail. Computer Bismarck, for example, was based on the Nazi pocket battleship Bismarck's attempt to smash through the British Home Fleet. Computer Ambush took a squad step-by-step through a bombed-out village in Occupied France.

Computer Air Combat combines the best features of those games and adds many new twists of its own, particularly the third dimension of altitude.

In Bismarck, the entire game was spent trying to find the enemy. The combat itself was secondary. Not so here.

In Ambush, there were so many factors to consider that it took a long time for the computer to determine what happened. Not so here.

The program uses the flight characteristics of 36 different WWII aircraft as a foundation. These range from the British Spitfire I to the American B-29 Superfortress, the Japanese A6M2 Zero Sen (Zeke) to the German Me 262A-1 jet fighter.

In the Bomber Intercept scenario, for

Dale Archibald, 1817 Third Ave. N., Minneapolis, MN 55405.

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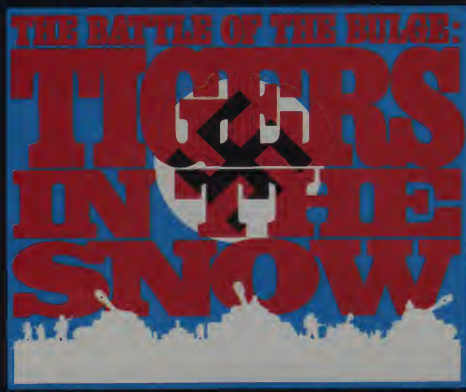

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instance, the player and opponent may choose a total of 16 aircraft of four types (interceptors against bombers and fighter escort) to be deployed. Dogfight matches fighter against fighter, again either randomly or with starting location, altitude, speed, etc., determined by the players. (Even a scramble from ground level is possible.) Yet when I matched five aircraft against the Apple's five, it took just a little over two minutes before it was time for me to move again.

There are general commands for the total flight, and specific commands for the individual planes. Global Plot, for instance, shows all sighted ships, friendly and enemy, as if you were looking down from above. But if an enemy aircraft can't be spotted by one of your pilots, it won't show on the screen until it can be.

The general command Position Report lists all information on sighted aircraft, including X and Y coordinates. You mark these on the map boards in grease pencil.

Status Report describes the damage a friendly aircraft has sustained, and the amount of ammunition remaining.

Movement shows a graphic plot from above of all aircraft 6,000 feet ahead, 2,000 feet behind, and 7,000 feet to the sides of the subject aircraft, at the beginning of the move. Listed underneath is the speed, altitude, and other information about the plane.

Tactical plot shows the same view after movement of all ships of both players.

If an enemy craft is within firing range *and* at the right altitude, *and* if the nose of the ship is at the right angle *and* you have ammunition left, you can fire. Combat can be selected after the Tactical plot. You are asked if you want to fire at possible targets, given the distances, etc.

Of course, there is a Quit and save game feature.

Movement

Moving aircraft to get them into battle is the most complex part of the game, and rightly so. Among other elements, movement depends upon the type of aircraft, speed, direction, altitude, bank and nose attitude. Both players' ships move at the same time, even though they enter their maneuver orders at different times.

There are nine possible maneuvers:

ST-Straight ahead

RR-Roll Right (a selected 45-180 degrees)

RL-Roll Left (same selection)

TR-Turn Right (45-degree direction change)

TL-Turn Left (same change left)

SR-Sideslip Right (move to right without changing heading)

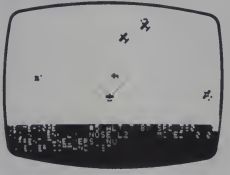
SL-Sideslip Left

NU-Nose Up

ND-Nose Down.

Each maneuver requires a certain distance change, depending upon type, speed, and altitude.

Speed is reduced with every maneuver except ST. It can be altered by throttling back in level flight, climbing, or diving. Go into a climb at too slow a speed, and your ship will stall. When it recovers from its out-of-control dive, your direction and altitude will have changed.



The roll maneuvers are perhaps the most important submaneuvers. (See Figure 1.) These change the bank altitude of the individual aircraft, and that affects turns, sideslips, climbs and dives.

Under the graphic during Movement mode are various listings, such as speed, altitude, present maneuver, etc., and bank. A bank of LV signals that the craft is level. A description of R1 (right roll, one point) means the ship is at a 45-degree angle to the horizon. R2 signals the wings are straight up and down at 90 degrees. The IR designation means the ship is inverted 135 degrees from the horizon, to the right. When it's level, but upside down, the caption is IV.

The ship continues through IL, L2, and L1 back to LV again. On the screen, each position is symbolized by a different graphic. Asking for an ID of any aircraft on the screen elicits its nationality, type, speed, heading, altitude, bank attitude, etc.

One last command is CK for Check capabilities. This gives a three-line summary of the capabilities of the aircraft you're flying, updated as you perform maneuvers.

Other factors in the game are Visibility, Combat Damage, and Ammunition Supply.

Joel Billings, president of SSI, said the company plans to bring out a supplementary disk of other aircraft from other fronts. It will be possible to arrange some very exotic matchups when that comes on the market.

Nevertheless, even with the present game, it will be difficult to exhaust the possibilities. Pilots can be aces, average, or inexperienced; matchups of combatants can be changed; scenarios can be tailored to actual air battles, and so on.

Weak spots? The instructions could be a bit clearer to emphasize certain key points. I'd also like to see illustrations on maneuvers. My friend would enjoy seeing action when moves are made, instead of just a listing of hits. But these are minor complaints.

Overall, I consider this one of the finest computer games of its type I've yet played. It is expensive but well worth $59.95 to those who like this type of strategic, thought provoking pastime. Detailed and comparatively fast-paced, Computer Air Combat is a marvelous game. □

"Thomas! We erase with the DEL Key, not our Pink Pearl!"

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FLIPPING OUT

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Dale Archibald

SOFTWARE PROFILE

Name: Raster Blaster
Type: Pinball machine
System: 48K Apple II or II Plus, single disk drive
Format: Graphics
Language: Machine
Summary: Super graphics
Price: $29.95
Manufacturer:
BudgeCo.
428 Pela Ave.
Piedmont, CA 94611

Apple owners who aren't familiar with Bill Budge should make his acquaintance. He was one of the first—and one of the best—at using the color graphics of the Apple to their greatest advantage. Some of his past works include Tranquility Base for Stoneware, and Space Album and Game Trilogy for California Pacific.

With Raster Blaster, Budge has added pinball wizardry to his repertoire. I didn't appreciate how good he was until I saw this game. The color, sound effects, and action are all superb.

As many as four people can play on two difficulty levels. I've only played on the easy level, with ball-saving shields always in place. On hard, the six center targets have to be hit before the shields come on; then, they only last for one ball.

There are two flippers operated by the game paddles, a force gauge to select how hard to shoot the ball, a tilt selector, four lane lights, three side targets, six center targets (small apples), four round center bumpers (large Apples), two side bumpers, Raster Blaster claws that grab a ball once you've hit all six center targets, and spinners.

All these features combine to create an almost perfect pinball game...perfect enough to form calluses on your flipper-pushing thumbs. Lights flash, noises sound, and the ball flips, bumps, and rolls just right.

Extra points are earned for completing all the lane lights, hitting all three side targets, hitting the six center targets and grabbing three balls in the claws (at which point all are dropped for four-ball play).

The "almost perfect" has to do with the operation of the flippers. At times, a ball traveling down the channel toward the flipper will speed up without warning. Also, if a ball is caught on the flipper after rolling down the channel, it doesn't bounce away; it just keeps bouncing off the flipper. But these are minor flaws.

I'm not much of a pinball player myself, but I can see where a person could save a lot of money with this program and a large color TV. For parties it's a natural awe-striker; the graphics are so impressive. It's also a great way to keep the kids away from those nasty folks down at the pinball parlor. Unless, of course, the kids invite them home to help. □

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creative computing software evaluation

An Old Challenger Bridges New Waters

Dynacomp Bridge Challenger

Owen Linderholm

creative computing
SOFTWARE PROFILE

Name: Bridge 2.0

Type: Bridge-playing game

System: 8K Apple, Atari, Pet, TRS-80, CPM and Disk Drive or cassette

Format: Disk/Cassette

Language: Basic

Summary: Reasonable bridge-playing program

Price: $17.95 for cassette, $21.95 for diskette

Manufacturer:
Dynacomp, Inc.
1427 Monroe Avenue
Rochester, NY 14618

In the December issue of the magazine we carried a review of the "only" two bridge playing programs or machines on the market. One other program that has been available for a year or so was inadvertently left out of the review, so it is presented here. The program is *Bridge 2.0* from Dynacomp; it costs $17.95 on cassette and $21.95 on diskette and is available for almost all the popular microcomputers, including Apple II, Atari, TRS-80, Commodore Pet and CP/M systems. The program itself is of a standard in between that of the two Bridge Challengers mentioned in the earlier article. It bids and plays three of the four hands, thus allowing only one human player.

This program is not a Master player, nor is it especially fast and it will never replace the company of even one other human player, but it could be useful when you are alone and feel like practicing a few hands. The program should also prove useful in training beginning players since it will probably not lose its temper or scream about incompetent, idiotic partners.

The program is written in Basic which means that the impatient card player will have to learn a little patience. In the actual play of the hand the delays are hardly noticeable, but during dealing and sorting the computer can hold up play for as long as twenty seconds. Bidding is somewhat limited since the computer only understands very basic bids. It takes an opening of a suit at the one level as showing 13+ HCP and a strong suit, an opening of two of a suit as 22+ HCP and a strong suit, a INT opening as a balanced hand with 16-18 points. Responses are totally natural and mean exactly what one would expect. No conventions are used at all, so the partners have little information about one another's hands, although they usually end up in the correct contract.

The program plays quite well, especially when it is defending against your contract. It plays less well when it has to defend against a contract. One of the best features of the program is the way it keeps track of the cards and deduces where voids are and who has the high cards in a certain suit. This means that it almost always knows when to pull trumps, ruff tricks and lead to its partner. Nevertheless the program only knows very straightforward tactics during play and cannot finesse or understand conventional leads. I also noticed it leading away from an ace on a few occasions. The program does seem to know how to make a squeeze, but only by using trumps and does so only on occasion.

The program has several disadvantages not directly related to the way it plays bridge. You cannot set up hands to play yourself, so experimentation with interesting hands is practically impossible. It is possible to repeat a hand or a certain series of hands, but the method used to achieve this is very clumsy. There are no graphics in the program, only text. This makes the program less convenient than it could be. One unusual feature of the program is that when you end up as dummy, you play your partner's hand, which lets you practice a bit more than you otherwise might.

```
                BRIDGE 2.0

      (C) 1981 BY DYNACOMP,INC.

ENTER ANY POSITIVE NUMBER:12
SHUFFLING
DEALING
SORTING



YOUR HAND (SOUTH):
   S: A6
   H: T865
   D: AQJ32
   C: J8

YOU ARE THE DEALER.
WHAT DO YOU BID?

SOUTH?1D
 WEST: 2C
NORTH: PASS
 EAST: 2H
SOUTH?PASS
 WEST: 3C
NORTH: PASS
 EAST: 3H
SOUTH?PASS
 WEST: 4H
NORTH: PASS
 EAST: PASS
SOUTH?PASS


THE CONTRACT IS: 4H
THE DECLARER IS:  EAST


REVIEW OF THE BIDDING:

SOUTH  WEST   NORTH  EAST
1D     2C     PASS   2H
PASS   3C     PASS   3H
PASS   4H     PASS   PASS
PASS


READY TO PLAY?YES


     ROUND:1
     ********
     4H      WE:0   THEY:0
                SOUTH:
                   S: A6
                   H: T865
                   D: AQJ32
                   C: J8
     SOUTH PLAYS ?KS
      WEST PLAYS: 5S
     NORTH PLAYS: 2S
      EAST PLAYS: 4S

     ROUND:2
     ********
     4H      WE:0   THEY:1
      WEST:
         S: QJT
         H: 73
         D: 7
         C: AKT632
                SOUTH:
                   S: 6
     4H            H: T865
                   D: AQJ32
                   C: J8
      EAST PLAYS: 3S
     SOUTH PLAYS ?6S
      WEST PLAYS: TS
     NORTH PLAYS: 4S

     ROUND:3
     ********
     4H      WE:1   THEY:6
      WEST:
         S: QJ
         H:
         D: 7
         C: AKT
                SOUTH:
                   S:
                   H:
                   D: AQJ32
                   C: J
     SOUTH PLAYS ?AD5
     ERROR IN LEAD. TRY AGAIN.
     SOUTH PLAYS ?AD
      WEST PLAYS: 7D
     NORTH PLAYS: 9D
      EAST PLAYS: 4D

     ROUND:9
     ********
     4H      WE:2   THEY:6
      WEST:
         S: QJ
         H:
         D:
         C: AKT
                SOUTH:
                   S:
                   H:
                   D: QJ32
                   C: J
      SOUTH PLAYS ?2D
       WEST PLAYS: TC
     NORTH PLAYS: KD
      EAST PLAYS: 5D
```

This shows you exactly how the computer plays a certain hand. In the listing is given an example of the way the computer deals and handles the bidding. A few of the rounds played are shown as well. As you can see the final contract was 4H by East which is too high since in another run of this hand I managed to set the contract by three tricks by leading the ace of diamonds followed by a low diamond which is ruffed in dummy. We were then allowed to take two spade tricks, one heart trick and two more diamond tricks. In this example I led the king of spades which was a very poor lead since it lost us the two spade tricks. Later my partner, the computer, lost us one of the diamond tricks by holding on to the king of diamonds and playing it when he had no way of getting back into my hand for the other diamond trick. This happened in rounds eight and nine shown in the listing. My computer partner, North, should have played the king on the ace, leaving me with two more diamond tricks. These mistakes meant that the computer made the contract which could have been set by at least two tricks.

As you can see, the computer plays less well when trying to stop a contract but it does play an adequate game and one that beginners will find challenging. A person who takes bridge seriously would probably have little to gain from the program, but it represents a reasonable value to the casual player or to the beginner. □

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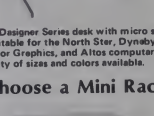

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CARD GAMES

BRIDGE 2.0 (Available for all computers) Price: $17.95 Cassette; $21.95 Diskette
An advanced version of the most popular of card games. This program bids BOSS and PLAYS the hand as expert or duplicate bridge. Depending on the contract, your computer opponents will either play the software against it or you bid too high. the computer will double your contract! BRIDGE 2.0 provides challenging entertainment for advanced players and is an excellent learning tool for the bridge novice! See the software review in 80 Software Critique. Rated #1 by Creative Computing.

HEARTS 1.5 (Available for all computers) Price: $10.95 Cassette; $19.95 Diskette
An exciting and entertaining computer version of this popular card game. Hearts is a trick-oriented game or a hach the purpose is not to take any hearts or the queen of spades. Play against two computer opponents who are armed with high, low and medium strategies. HEARTS 1.5 is an ideal game for introducing the uninitiated (your spouse!) to computers! See the software review at 80 Software Critique

STUD POKER (Atari only) Price: $11.95 Cassette; $15.95 Diskette
This is the classic gambler's card game. The computer deals the cards one at a time and you (and the computer) bet on what you see. The computer does not cheat and actually bets the odds. However, it does occasionally bluff! Also included is a free card draw poker betting practice program. This package will run on a 16K ATARI. Color, graphics, sound. See review at COMPUTE.

POKER PARTY (Available for all computers) Price: $17.95 Cassette; $21.95 Diskette
POKER PARTY is a 4 on poker simulation based on the basic, POKER, by Dick Hoyt. This is the most computer sophisticated simulation for microcomputers. The party consists of yourself and three computer opponents. Each of these players is you will get to learn them has a different personality! the fun of a card playing psychiatrist's bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! See Creative and diskette versions require a 32 8 for larger Apple II

CRIBBAGE 2.0 (TRS-80 only) Price: $10.95 Cassette; $10.00 Diskette
This is exactly the best cribbage game available. It is an excellent program for the cribbage player at search of a worthy opponent as well as for the novice wishing to learn the game. The graphics are superb and assembly language routines provide rapid execution. See the software review at 80 Software Critique

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Atari, North Star and CP/M only) Price: $19.95 Cassette
$23.95 Diskette
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon seminar games played at graduate business schools, you play your team against a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The computer referees the game and tells you how well you have done. The simulation is real!

FLIGHT SIMULATOR (Available for all computers) Price: $17.95 Cassette; $21.95 Diskette
A realistic and extensive mathematical simulation of aircraft flight and landing. FLIGHT SIMULATOR includes equations and the characteristics of a real airline! You can practice instrument approaches and navigation using radials and compass headings. The more advanced user can perform loops, half-rolls and other simulated aerial maneuvers. Although this program does not employ graphics, it is exciting and very addictive! See the software review at COMPUTRONICS. Rated #1 by Atari.

VALDEZ (Available for all computers) Price: $15.95 Cassette; $19.95 Diskette
VALDEZ is a realistic simulation of supersonic navigation in the Prince William Sound located between regions of Alaska. Included in this simulation is a realistic and extensive 256 × 256 element map, portions of which may be viewed using the unit's alphanumeric display. The second unit display The measure of your progress mathematically. The simulation also contains a model for the tidal patterns at the region, as well as other traffic navigating vessels and drifting icebergs. Test your control from the Gulf of Alaska to the Valdez terminal! See the software review in 80 Software Critique

BACKGAMMON 2.0 (Atari, North Star and CP/M only) Price: $14.95 Cassette; $19.95 Diskette
This program tests your backgammon skills and will also improve your game. A human can compete against the computer or against another human. The computer is a worthy opponent! Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

CHECKERS 3.0 (PET only) Price: $10.95 Cassette; $20.95 Diskette
This is one of the most challenging checkers programs available. It has 10 levels of play and allows the user to change skill levels at any time. Although providing a very tough game at level 4.0, CHECKERS 3.0 is practically unbeatable at levels 9 and 10

CHESS MASTER (North Star and TRS-80 only) Price: $19.95 Cassette; $23.95 Diskette
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language. Six SOPHISTICATED SPECIAL TESTS of (Laboratory) Full graphics are employed on the TRS 80 version, and two widths of alphanumeric display are provided to accommodate both Size users.

LEM LANDER (32K Apple Disk only) Price: $10.95 Diskette
Place your LEM LANDER in a safe landing on any of nine different surfaces ranging from smooth to treacherous. The game parallels are used to control craft attitude and thrust. This is a real time high res challenge!

FORENT HRE ! (Atari only) Price: $10.95 Cassette; $20.95 Diskette
Using excellent graphics and sound effects, this simulation puts you on the middle of a fierce fire! Your job as a district operations to put out the fire while compensating for changes in wind, weather and terrain! Not protecting valuable structures can result in startling results! FORENT HRE ! is available as a cassette for ATARI 16K computers! Fast, exciting and challenging. No two games have the same setting and there are 3 levels of difficulty.

NOMINOES JIGAWS (Atari, Apple and TRS-80) Price: $16.95 Cassette; $20.95 Diskette
A jigsaw puzzle on your computer! Complete the puzzle by selecting your pieces from a table consisting of 60 dirf ferent shapes. NOMINOES JIGAWS is a custom programming extension effort. The graphics are superlative and the puzzle a all challenge you with six three levels of difficulty. Scoring is based upon the number of guesses taken and by the dif fficulty of the board set up. See review at ELECTRONIC GAMES

MONARCH (Atari only) Price: $11.95 Cassette; $15.95 Diskette
MONARCH is a fascinating economic simulation requiring you to survive for a four years as your domain's leader You determine the amount of acreage devoted to industrial and agricultural use, how much food is distributed to the populous and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy.

CHOMPIEGO (Atari only) Price: $11.95 Cassette; $15.95 Diskette
CHOMPIEGO is a really new challenging games in one. One is similar to PONG you think line off part of a circle, but are not ride by the prevented portion. The other game in the popular board game RENVERSI It fully uses the Atari's graphics capability, and is hard to lose. This package will run on a 16k system.

ATARI, PET, TRS-80, NORTHSTAR, CP/M and IBM are registered tradenames and or trademarks.

**If assign were noted, all model I software is available for the Model III. TRS-80 diskettes are not supplied with DOS or BASIC*

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BLACK HOLE (Apple only) Price: $14.50 Cassette; $18.00 Diskette
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe The object is to move and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program simulates Mi Ran graphics and is educational as well as challenging

SPACE TILT (Apple and Atari only) Price: $10.95 Cassette; $14.00 Diskette
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MOVING MAZE (Apple and Atari only) Price: $10.95 Cassette; $14.00 Diskette
MOVING MAZE employs the game paddles to direct a puck from one side of a maze in the other However, the maze is dynamically (and randomly) built and is continually being modified. The objective is to cross the maze without touching the walls (or being hit by) a wall. Scoring is by ex ellapsed time indicator, and three levels of play are provided

ALPHA FIGHTER (Atari only) Price: $14.95 Cassette; $18.98 Diskette
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien warships passing through your sector of the galaxy. ALPHA BASE is on the pack of ex aliens LPD ironant, let five LPD s get by and the game ends Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K system

THE RINGS OF THE EMPIRE (Atari only) Price: $10.95 Cassette; $20.95 Diskette
The empire has developed a new hair-ar raptors processed by rotating rings of energy. Each time you blast through the rings the energy level of the raptor increases. Can you maintain a slow run on rush hour? Can you make it through the rings at 100 xxxmiles, amphora extreme graphics and sound and can be played by one or two players

INTRUDER ALERT (Atari only) Price: $10.95 Cassette; $20.00 Diskette
This is a fast paced graphics game a hach players you in the middle of the "Dreadnaz" hex-ag con sealers etc plans. The droids have been alerted and are directed to destroy you at all cost. Your main task is to avoid your pilot in escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems

GIANT SLALOM (Atari only) Price: $10.95 Cassette; $20.95 Diskette
This real-time action game is guaranteed addictive! Use the joystick to control your skier through slalom courses each scoring of both open and closed gates. Choose from a different levels of difficulty! Fast against other players or simply take practice runs against the clock GIANT SLALOM will run on 16K systems

TRIPLE BLOCKADE (Atari only) Price: $10.95 Cassette; $10.95 Diskette
TRIPLE BLOCKADE is a one-to-three player graphics and sound action game. Based on the classic video arcade game which millions have enjoyed. Using the Atari projectors, the object is to direct your blockading line around the screen without running into your opponent(s). Although the computer is simple, the sound graphics sound effect lead to "high anxiety"

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GAMES PACK 1 contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more! This extensive collection of computer language programs is easy to modify. They are individually accessed by a convenient menue. This collection is worth the price just for the DYNACOMP version of BLACKJACK

GAMES PACK II (Available for all computers) Price: $10.95 Cassette; $14.00 Diskette
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MOON PROBE (Atari and North Star only) Price: $11.95 Cassette; $15.95 Diskette
This is an extremely challenging "Lunar Lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface You control the thrust and orientation of your craft plus detect the rate of descent and approach angle

SPACE LANES (North Star only) Price: $16.95 Diskette
SPACE LANES is a sizable but exciting space transportation game which involves up to four players (including the computer). The object is to form and expand space trajectories between compass as a competitive effort. The game is to amass more net worth than your opponent. The economics include stock purchases and company mergers Watch your wealth grow!

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CRANSTON MANOR ADVENTURE (North Star and CP/M only) Price: $21.95 Diskette
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TNT Software

The following DYNACOMP programs are available for use with TNT

STUD POKER (Atari, 24K)
NOMINOES JIGAWS (Atari, 24K)
CRIBBAGE 2.0 (TRS-80 Level II and North Star)
CHOMPIEGO (Atari, 16K)

Please specify TNT versions when ordering

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FORM LETTER SYSTEM (FLS) is the ideal program for creating and editing form letters and address lists. It contains an easy to use text editor, a powerful mail merge routine, and a full featured mailing list program. Letters can be personalized almost to the point of being individually typed. FLS is completely compatible with MAIL LIST 2.2, which may be used to manage and sort your address lists.

FLS and MAIL LIST 2.2 are available or a combined package for $79.95

SORTIT (North Star only) — **Price: $29.95 Diskette**

SORTIT is a general purpose sorting program written in 8080 assembly language. This program will sort sequential data files generated by NORTH STAR BASIC. Printing is also supported. Sorting is performed on any field in the data file. Features of SORTIT is easily used with files generated by DYNACOMP's MAIL LIST program and is very versatile in its capabilities for all users of NORTH STAR disk BASIC.

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PFS is a single diskette, menu-oriented system designed for the beginner. Provides checking account, personal and tax deductible notes. PFS will sort and summarize expenses by payee, and displays all information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1800 records per disk by making 3 copies and changing to the program). You can record check plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations.

FAMILY BUDGET (Apple only) — **Price: $34.95 Diskette**

FAMILY BUDGET is a very convenient financial record keeping program. You will be able to keep track of your financial expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET is a very powerful program which will allow you to budget your money and keep track of your expenses in up to 14 different personal accounts as well as up to 7 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

INTELINK (Atari only) — **Price: $49.95 Diskette**

This software package contains a mess-driver collection of programs for facilitating efficient two way communication onto through a full duplex modem required for use). In one mode of operation you may connect to a data service (e.g. The SOURCE, CompuServe, Dow Jones News Service, etc.) and automatically capture data directly to disk. Information "downloaded" can also be viewed on the screen for immediate examination of a convenient time. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer. Nothing like this has been available. Even basic BASIC programs can be quite useful. Further a command file may be built off-line and sent one at a controlling input for a time share system. That is, you can set up your sequence of time-share commands with a text editor, and the Atari will transmit them at the appropriate time. Even this adds up to saving both connect time and your time!

TEXT EDITOR II (CP/M) — **Price: $29.95 Diskette; $35.00 Data**

This is a full featured version of DYNACOMP's popular TEXT EDITOR 1 and contains many new features. With TEXT EDITOR II you may build text files in memory and assemble them for later display. Blocks of text may be appended, inserted or moved. Files may be saved on disk diskette or right justified corrected formats to be later printed by either TEXT EDITOR II or the CP/M MD Editor/Formatter. TEXT EDITOR II includes BASIC and assembly language programs to be used by the advise and processed. In fact, text files can be built using ED and later formatted using TEXT EDITOR II. All in all, TEXT EDITOR II is an inexpensive, easy to use, but very flexible editing system.

DRIL (Atari and North Star disk diskettes only) — **Price: $19.95**

This handy program allows North Star and Atari disk users to maintain a stored-used data base of all files and programs at the each of disks which overcrafts accumulate. DRILL is easy to set up and use. It will organize your disks to provide efficient keeping of the desired file or program

FINDIT (North Star only) — **Price: $19.95**

This is a three-in one program which maximizes information accessible by keywords of three types: Personal (eg. last name), Commercial (eg. plumbers) and Reference (eg. magazine articles, record albums, etc.). In addition to keyword searches, you are birthday, anniversary and appointment searches for the personal records and appointment searches for the commercial records. Reference records are accessed by a single keyword or by cross-referencing two or three keywords

SHOPPING LIST (Atari and North Star only) — **Price: $22.95 Cassette; $16.95 Diskette**

SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you what you need to buy. Then you can display or optionally print your shopping list and the total cost. Adding, deleting, changing and moving data is very easy. Runs with 16K.

TAX OPTIMIZER (North Star only) — **Price: $89.95 Diskette**

The TAX OPTIMIZER is an easy-to-use, menu-oriented software package which provides a convenient means for analyzing various income tax options. The program is designed for the "average" taxpayer and does not require knowledge of accounting or tax matters. Using the TAX OPTIMIZER, you can easily determine the tax consequences of various options, such as the effect of capital gains and deductions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files.

EDUCATION

HODGE PODGE (Apple only, 48K, Applesoft or Integer BASIC) — **Price: $19.95 Cassette/$22.95 Diskette**

Let HODGE PODGE be your child's friend. This educational program lets an Apple II/II Plus or Apple II/II Plus with Language Card computer "help-persons" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 3 to 8. HODGE PODGE is a non-condescending teaching device which brings a new dimension to the use of computers in education.

TEACHER'S PET (Available for all computers) — **Price: $11.95 Cassette/$15.95 Diskette**

This is the first of DYNACOMP's educational packages. Primarily intended for pre-school or grade 3, TEACHER'S PET provides the young student with charming creative, letter-word recognition and three levels of math skill exercises.

MISCELLANEOUS

CRYSTALS (Atari only) — **Price: $ 9.95 Cassette/$11.95 Diskette**

A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the continual effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY

DYNACOMP now distributes the NSSE library. Each diskette each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.

Price: $9.95 each (#7 #5 specials at no more)
The complete collection may be purchased for $149.95

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run in the 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskettes. Additionally, most programs can be obtained on standard (IBM format) 8" CP/M floppy disks for systems running under MBASIC.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) — **Price: $29.95 Cassette; $43.95 Diskette**

DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. The filter forms are subsequently converted into digital convolution coefficients which permit rapid data processing. In the analyst design mode the shape of the frequency transfer characteristic is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) — **Price: $19.95 Cassette; $24.95 Diskette**

The special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally useful. The software uses a least squares curve fitting technique to fit a set of 7th, or lower, degree polynomial to a specified number of data points. Also included is automatic plotting of the input data and smoothed result.

FOURIER ANALYZER (Available for all computers) — **Price: $19.95 Cassette; $24.95 Diskette**

Use this program to examine the frequency spectra of transient duration signals. The program allows the scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) — **Price: $19.95 Cassette; $24.95 Diskette**

This is a special software package which may be used to evaluate the transfer functions of electronic devices such as filters and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log frequency plot as well as linear plots. Like FOURIER ANALYZER, TFA is also designed for educational and scientific use. TFA is an engineering tool. Available for all computers

HARMONIC ANALYZER (Available for all computers) — **Price: $34.95 Cassette; $28.95 Diskette**

HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage; retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

POLYFIT and HARMONIC ANALYZER may be purchased together for a combined price of $49.95 (disk cassette) and $79.95 (disk diskette)

REGRESSION I (Available for all computers) — **Price: $19.95 Cassette; $24.95 Diskette**

REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy, an unconstrained mode, automatic data storage and retrieval routines, library of frequently used functions, data editing, pointwise data and curve plotting, a statistical analysis (eg. standard deviation, correlation coefficient, etc.) and a special mode for the analysis of data with zero and without mentioning the data. REGRESSION I contains the common core program or are data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) — **Price: $19.95 Cassette; $24.95 Diskette**

PARAFIT is designed to handle those cases in which the parameters are embedded (possibly nonlinearly) in the fitting function. The most simply known by function forms, including the parameter α in $A(1-\alpha)$, β in $\sin\beta x$ and γ in $\ln(x+\gamma)$. Maximum flexibility has been provided in that any or all parameters may be manipulated and printed as well as REGRESSION I. Use REGRESSION I for polynomial fitting and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) — **Price: $24.95 Cassette; $28.95 Diskette**

MLR is a professional software package for almost any data set containing two or more independent variables. Besides performing the basic regression calculation, the program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interpret the solution by means of the statistical analysis which is provided. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.90 (four cassettes) or $61.95 (three diskettes)

ANOVA (Available for all computers) — **Price: $19.95 Cassette; $43.95 Diskette**

In the past the ANOVA capability of experimenters has been limited to the large mainframe computers. Now DYNACOMP has brought the power of ANOVA to the microcomputer! The three computer-set ANOVA is the DYNACOMP program which performs a one-way, two-way and three-way analysis of variance. Whether you are a student learning about these subjects with ANOVA, do not worry. The accompanying documentation was written as a tutorial (unless why a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending

BASIC SCIENTIFIC SUBROUTINES, Volume I (Not available for Atari)

DYNACOMP is the exclusive distributor for the software keyed to the popular text *BASIC Scientific Subroutines, Volume I* by Brademeyer (see the BOOK REVIEW section elsewhere in this magazine). Each of the 66 subroutines has been rewritten according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Collection #1 Chapters 2 and 3 Data and functions (interpolation, smoothing)
Collection #2 Chapter 4 Matrix and vector operations
Collection #3 Chapters 5 and 6 Random number generators, series approximations
Price per collection: $14.95 Cassette $18.95 Diskette

All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes)

Because the text is a real part of the documentation, *BASIC Scientific Subroutines, Volume I* is available from DYNACOMP for $19.95 plus 75¢ postage and handling. Not shown in the book.

BOOTS (Available for all computers) — **Price: $10.95 Cassette; $14.95 Diskette**

In a nutshell, BOOTS simultaneously determines all the zeroes of a polynomial having real coefficients. There is no limit on the degree of the polynomial, and because the procedure is iterative, the accuracy is generally very good. No initial guesses are required of input, and the calculations need not be terminated by the user because of excessive computer time.

ACTIVE CIRCUIT ANALYSIS (ACAP) (48K Apple only) — **Price: $29.95 Cassette; $29.95 Diskette**

ACAP is the leading circuit designer's answer to DIGITAL SIMULATOR. With ACAP you may analyze the response of an arbitrary linear circuit containing up to 50 nodes. The circuit may be described from files, as it is entered from the keyboard. The frequency and the resulting complex (i.e., real and imaginary) voltages at the nodes are automatically examined. By plotting the magnitude of these voltages, the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Simply describe the circuit in terms of the elements and their placement, and execute. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time. Resistors or altering. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only, 48K RAM) — **Price: $34.95 Cassette; $38.95 Diskette**

LOGIC SIMULATOR is a powerful, high speed, four complicated digital logic design with respect to given set of inputs to determine how well the design will operate. The elements which may be evaluated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J K and D flip flops, and one shots. The response of the system is available every clock cycle. Inputs may be created as with a pattern generator or may be entered from the keyboard. Data may be stored to probe for glitches and race conditions. At the user's option, a timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding and prototyping time and check it out with LOGIC SIMULATOR.

LOGIC DESIGNER (North Star and CP/M only) — **Price: $34.95 Diskette**

LOGIC DESIGNER is an exceptional Computer Aided Design (CAD) program. With it you may convert a large and complicated digital truth table (the functional specification) into an optimized Boolean logic equation. This equation may then be easily converted into a circuit design using either NAND or AND/OR gates (user selectable). LOGIC DESIGNER is composed of a BASIC program which calls on a machine language routine to reduce execution time. Example. For a 7-variable by 127 line table, the processing time is only two minutes. LOGIC DESIGNER is clearly a fast and powerful tool for building digital circuits.

ORDERING INFORMATION

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Add $2.50 to the listed diskette price for each 8" CP/M disk(s) (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC 80

5¼" CP/M Disks
All software available on 5¼" CP/M disks is also available on 5¼" disk, North Star format

Ask for DYNACOMP programs at your local software dealer. Write for detailed descriptions of these and other programs from DYNACOMP

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creative computing software evaluation

Crypto Machine

George A. Miller

creative computing SOFTWARE PROFILE

Name: Crypto Machine
Type: Puzzle
System: 48K Apple II, Disk Drive
Format: Disk
Language: Applesoft
Summary: Good for cryptogram addicts
Price: $40
Manufacturer:
Shafer Software
465 South Matilda Suite #202
Sunnyvale, CA 94086

Crypto Machine by Dan Shafer is not your gut wrenching, nail biting, edge-of-the-chair action game but rather a game of pure intellect in which 10 minutes is rated super fast.

Crypto Machine is a mechanical aid for solving the cryptograms found below the crossword puzzles in your daily newspaper. The puzzle involves a sentence or saying which has been encrypted using a simple substitution cipher in which each letter used stands for another. If you think that T equals A, it will equal A throughout the puzzle. An example of such a puzzle is:

PVSL HCGVSM FBWGCLC
GLSTLGLT FBWVSC PBMBLH

The Crypto Machine runs on an Apple II and will display a cryptogram on the screen. Below each letter is a dash. You can position the cursor under any letter and replace a dash with your guess of the substitution letter. The program will automatically make all equivalent substitutions. This allows you to change your mind and try many different solutions before homing in on the correct one.

George A. Miller, 2426 Bush Street, San Francisco, CA 94115.

Crypto Machine also has a library of sayings from which it can create its own random cryptograms. You may also add your own sayings to the library. There are five levels of difficulty, the hardest being given just 10 minutes to solve a cryptogram that has had all the words strung together and then split into five character groups to eliminate word length hints. (I can't imagine anyone ever being able to do level five!)

There were some areas where this game could be improved. When I first played the game I could not figure how to move the cursor up and managed to lose it. After about five minutes of random keystrokes, the cursor magically appeared on the screen and I was able to continue where I left off (a left arrow hit at the left hand margin of the screen will cause the cursor to rise).

Once I substituted a letter, I could change the letter but never go back to the dash. It would be nice if I could do this since once all the dashes are gone the computer asks if you are finished.

It takes about eight seconds for the program to make a single letter substitution. This is too slow. My tolerance is about one second.

Finally, the library contains just nine sayings. This could be greatly enriched. Of course you can add your own, but then you always remember what you have typed in. It seems much could have been added by including a library of about one thousand sayings.

Finally, I must allow my own biases to enter into the review and state that I enjoy giving the difficult work to the computers and saving the simple stuff for myself. Here is a case where the computer is giving the hard work to the human. ("Here, Buster, see if you can solve this in 10 minutes.") A more interesting computer program might be one to *solve* cryptograms. Nonetheless, Crypto Machine will definitely be enjoyable for the confirmed cryptogram addict. □

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Where your secret weapon is the fourth dimension...

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CIRCLE 238 ON READER SERVICE CARD

In the center of an orbiting space station you are protected only by a revolving force shield. Enemy forces are advancing from all directions and begin to place killer satellites in orbit around your station. And then, look out for the meteors!

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A "bloody" good game for the true-blue game freak. Your mission in this exploratory operation is to deliver whole blood to Hemophilia, a city in the sky, and return to Anemia Base before the Gamma Goblins overcome you. A real heart stopper!

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CIRCLE 238 ON READER SERVICE CARD

What say we go out and stomp a few???

Endless Excitement Stomping Sneakers And A Swarm Of Other Creatures

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CIRCLE 238 ON READER SERVICE CARD

Phantoms Five simulates a fighter-bomber mission in real time, three dimensional color graphics. While you try to make your bombing run, you have to avoid being hit by anti-aircraft fire and fight off enemy aircraft as well.

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Hatch some fun with the Spiders, Wolves, Lips, and Fuzzballs. Space Eggs will crack you up! Each package includes a multi-color T-shirt iron-on that says "I FRIED THE SPACE EGGS."

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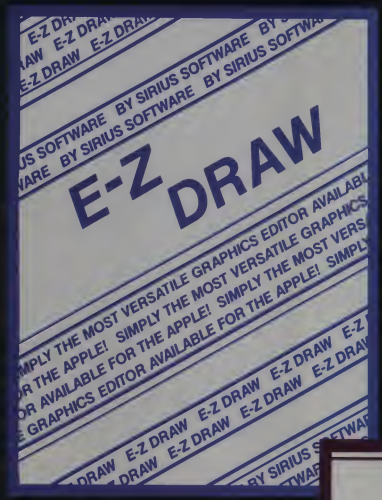

This is the graphics editing package we based our business on. Includes the Higher Text Character Generator by Ron & Darrell Aldrich and over 20 original and imaginative type styles.

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Pascal Graphics Editor

PGE

The professional graphics editing package for use within the Pascal environment

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BOTH BARRELS

A two game pack featuring "High Noon" and "Duck Hunt". You'll love the bad guy that falls off the roof and the dogs fighting over the ducks. Fun for the young and the young at heart.
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STAR CRUISER

Save yourself from the swooping aliens! This is a fast action arcade style game that can be played from ages three and up, but beware, the difficulty increases with each new wave of aliens.
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CYBER STRIKE

Interstellar challenge for the dedicated arcade gamer. You are in command of a light transport ship equipped with Hyperspace Drive, Antimatter Torpedoes, Local and Galactic Sensors, Meteor Shields, and an Instrument Panel which continually tabulates all information vital to your mission. You alone can prevent the clone take over of the allied settlement bases. WARNING . . . this game requires practice to play successfully.
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AUTOBAHN

Hair raising excitement at 120, 160, and 200 kilometers per hour! Drive through heavy traffic, oil slicks, narrow roads, and dark tunnels (with headlights). Watch out for the fire trucks! Only on the Autobahn can you drive this fast.
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PULSAR II

A unique two game series that provides scoring options for separate or combination game play. To destroy the "Pulsar" is no easy task. It is surrounded by spinning shields that send out orbs of energy aimed directly at you. "The Wormwall" places you in one of the strangest mazes ever created. The walls do not connect. Openings only occur temporarily as moving colored segments in the walls cross. In addition, there are munching mouthers in each level of the maze ready to gobble you up should you misjudge the time and location an opening will occur.
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2011 Arden Way #2, Sacramento, California 95825

PROGRAMMING: Lunar & Rescue was programmed by Alan Merrell and Tom Knopp. Cyber was programmed by Larry Miller. Cyber Strike was programmed by Alan Merrell. Shamus was programmed by Robert Dillman. Shamus II was programmed by Chris Gray. Star Cruiser was programmed by Mark Turmell. Sneakers was programmed by Mark Turmell. Sneakers II was programmed by Mark Turmell. Snake Byte was programmed by Jeff Hyman and David Lubar. Cyber Strike Instrument and Panel were programmed by [illegible].

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SYSTEM REQUIREMENTS: All software mentioned in this advertisement requires an Apple II, II+ or IIe with 48K with the following exceptions: Star Cruiser requires 48K Apple with Applesoft ROM or a 64K Apple II Europlus. Pulsar II requires an Apple II, II+ or IIe with Language System.

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creative computing software evaluation

Apple/UCSD Pascal 1.1: A User's Evaluation

Ross M. Tonkens

Having lived with Apple's newly updated version of UCSD Pascal (Pascal Ver. 1.1) for over a month, now. I feel a few observations are in order.

First, let me say that the manuals alone are worth the $60 update cost, for those of us who have had to live with the infamous "White Book" for the last year and a half. Just the sight of a real index (spanning more than seven pages!) brought tears of joy to my eyes.

In fact the system consists of over two manuals and four disks. I say "over two" manuals because there are two full-fledged reference manuals, one for the operating system, and one for Apple's implementation of UCSD Pascal. Both manuals are of the outstanding glossy quality to which we have become accustomed from Apple. I might add in passing that the graphic artwork gracing the covers of the manuals would sell briskly as poster art. In addition, three 9- to 16-page pamphlets are included. One describes differences between the old and new versions of Apple/UCSD Pascal; one is an addendum to the new operating system reference manual; and the third is an addendum to the new Pascal language reference manual.

Perhaps the best features of the current update are found only in these addenda. Among them were EXEC files, chaining capability, built in upper and lower case text generation without hardware add ons, much faster compile times, new compiler options, and an explicit list of previous bugs, fixed in this new version. Also contained in one of these little pamphlets is, at last, a lucid description of how program segmentation is accomplished by the compiler which clears up many mysteries left unresolved by even monk-like study of previous documentation.

Ross M. Tonkens, M.D., 622t Wilshire, Suite 607, Los Angeles, CA 90048.

This is all fine, but "how well does it wear?" as the saying goes. In short, "very well, indeed." All of the inconsistencies in how the operating system previously handled files with the special suffixes, ".text" and ".code" have been resolved. Combined with the addition of EXEC file capability, this has increased my productivity by at least 100%.

Now the user can define a common sequence of operating system commands, for example, those steps taken to compile and link a UNIT and install it in a library, or the commands issued to compile, link, and run a program, and have the computer perform them automatically in sequence, rather like a job control language. Instead of having to watch the computer full time, I now simply call up an EXEC file and take a break while the boring processes of compilation, linking, and test running all take place unattended.

EXEC files almost make up for my lack of a hard disk drive in terms of the increase in throughput achieved. About the only new problem the changes have created is temporary obsolescence of any memory-sensitive software, since the old memory map on which such software would have been based has been changed. This problem should be only temporary, as the update will involve simply altering the CONSTANT declarations of any Pascal 1.0 program which referenced memory directly once the new memory map is published by Apple. This brings me to my only complaint, namely that the new Pascal 1.1 manual did not already contain this information.

While the new Apple/UCSD Pascal Ver. 1.1 still has its idiosyncrasies, Apple seems to have distilled out those problems which were truly intolerable, while adding numerous conveniences which make it a truly serious software development system at last.

Now if I could just save the money for that hard disk.... □

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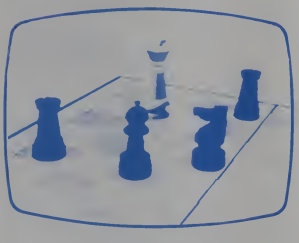
ZGRASS GRAPHICS LANGUAGE



In a few short months, I am able to do things I never thought possible while programming in Basic.

Tom Meeks

There is an aura of mystery surrounding any new language. Perhaps the names of the languages have something to do with it. That old familiar language, Basic, just *sounds* so easy! But, does "easy" come to mind when we first hear the names Pascal, Smalltalk, Forth or Zgrass? Probably not. Yet, once we get behind the names and esoteric jargon we find that, in fact, some of these strange sounding names hide languages that are quite easy to learn and, for many applications, far simpler than Basic to implement.

Since most of us are, by nature, ruled by the laws of inertia we tend to resist the new in favor of the familiar. In my own case, it took a great deal of frustration with the limited ability of Basic to produce animated graphics in a reasonable amount of programming time to initiate a search for an alternative. As luck would have it, I stumbled onto Zgrass, a thoroughly enjoyable graphics language.

My company, Communication Resource Management Systems, is a small video company involved in producing training materials for government and industry. When it became evident that we would have to know about computers if we were to remain competitive in video I began to shop around. After careful search a system was selected and the business of learning Basic was begun.

If my primary objective had been to write checkbook programs or play number games I might still be programming in Basic. However, my goal was to produce computer graphics to enhance the educational value of the video tapes we produce. Frankly, Basic was totally frustrating.

The hardware was fully capable of everything we wanted: Basic just couldn't access that power in anything approaching a reasonable amount of time. Just when I had almost given up computer animation as a lost cause I read a report about SIGGRAPH'80 (*Creative Computing*, January '81) which mentioned a new computer featuring Zgrass, a language specifically designed for animation and video graphics. Taking a chance, I purchased one of the first Datamax UV-1s produced. The results have far exceeded any expectations I may have had. Zgrass is easier than Basic . . . and it works!

Perhaps some perspective can be added to the last statement if I point out that when my Datamax UV-1 was delivered in February 1981, I had never even seen the Zgrass program, and the nearest Zgrass programmer was in Chicago, over 800

Tom Meeks, 11004 Stillwater Ave., Kensington, MD 20795.

High-Resolution Color Graphics for the Apple and Atari

Graphics Breakthrough

How many programs have you written that would benefit from animated high-resolution graphics? Probably several. It is this kind of dramatic graphics that distinguish outstanding programs from ordinary ones. But if you've ever agonized for hours or days just to get one image perfected, you're probably not anxious to do it again. Now there's a better way.

New Graphics Entry System

Today there is a new graphics system available that is not only amazingly user-oriented but surprisingly economical. Called VersaWriter, it starts with an ingeniously simple entry board consisting of a 14" X 12" high impact plastic bed with a tough clear plastic overlay sheet. The original drawing or diagram is fastened with masking tape to the plastic bed and then covered with the clear sheet. Instead of using a light pen or complicated electronic X-Y head, the VersaWriter uses a double jointed arm attached to the top of the entry board at one end and a magnifying lens with crosshairs at the other end. The VersaWriter resembles a draftsman's pantograph on a smaller scale.

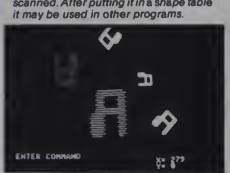
At each joint in the arm of the VersaWriter is a potentiometer. A cable from these pontentiometers connects to the paddle input of the computer. No special interface electronics or board is needed. Since the arm of the VersaWriter bends only in one direction, each point on the plotting head corresponds to a unique set of resistances on the potentiometers. All that's needed now is software to translate these resistances into usable screen coordinates.

Exceptionally powerful software

It is in the software where VersaWriter really stands out. VersaWriter comes with two full disks of user-oriented software. First it has sets of "low level" commands for entering, creating and copying drawings and diagrams. Secondly, it has extensive sets of application routines for moving, enlarging, rotating, coloring or animating drawings that the user has created.

Of course the basic commands let you enter a drawing freehand or by tracing it. Want a wider brush stroke? Six widths are available. Drawings can be independently scaled in both the vertical and horizontal directions. An enclosed shape may be filled in with any of 106 colors. No, that is not a misprint—By the same technique that a printing press can create hundreds of colors from the three primary ones, so can VersaWriter.

Here a shape (the letter A) is being scanned. After putting it in a shape table it may be used in other programs.



From the shape table, a shape (the letter A) may be enlarged, rotated, colored or moved about the screen.

Create Animation for Other Programs

The shapes you create with VersaWriter can be used and manipulated with ease in other programs. Up to 255 shapes can be entered into a shape table. These shapes may then be placed on the screen in any position or may be overlaid on a full or partial screen image. Animation is produced easily by moving about a portion of the image created by VersaWriter. For example, by alternating between two images of an airplane propeller it will appear to be spinning.

Other VersaWriter software includes text-writer with which text can be added to graphics. Upper and lower case, choice of color, text size, direction and starting point all may be specified.

The Area/Distance program lets you calculate distances (or perimeters) by entering a scale and tracing a shape or map route with the drawing arm. Areas of figures, open and irregular, can be similarly calculated.

The software also includes sets of electronic and computer logic shapes. In addition, an entire disk of dramatic demonstration graphics is included. These twelve full-screen graphics run the gamut from a fully labeled cross section of a human skull to colored maps to animated cartoons to an electronics schematic.

Software Updates

You may have read a review of VersaWriter that indicated that the color fill routine was slow. It was. But not any more. Several routines and improvements were added to the VersaWriter software since its introduction. An added feature, the Expansion Pac, is also now available. This third disk of software contains an area distance program, a microscope feature, and will save your graphics in the exact colors you prefer. It also includes shape tables for architecture, plumbing, electrical, circuit boards, landscape, chemistry, games, and more; 350 predefined shapes in all.

At Peripherals Plus, we evaluated every graphics device. We wanted to handle the best one regardless of price. VersaWriter has the best performance bar none. Surprisingly, it also has the lowest price, just $299.00 for the Apple version. It requires an Apple II Applesoft in Rom (or an Apple II Plus), disk, and 48K memory. VersaWriter comes complete with two disks of software, a comprehensive instruction manual, and a 90-day limited warranty. The additional Expansion Pac is available for $39.95.

The Atari version, which varies slightly from the Apple version in number and types of functions performed, is available for $299.00. As new updates are developed for the Atari, Peripherals Plus will furnish them free to all customers—just send us the disk and we'll supply the updated material. We make this unique offer because it is in our best interest to have you make the best use of your computer. We're also convinced that if other people see your VersaWriter in use they'll want one too.

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miles away. Yet, in a few short months, I am able to do things I never thought possible while programming in Basic—even with the generous help of scores of experts in the Washington D.C. area.

First Impressions of a Basic Programmer

My first contact with Zgrass came in the form of a video tape demonstrating Zgrass animation and video art. It's a good thing I had seen the tape, too, for it carried me through the initial shock of my first contact with the language itself. This shock only lasted for an hour or so, but it was severe! There were no line numbers, no FOR-NEXT loops and more than one program could be stored and run at the same time.

My Basic programmer's head reeled! Build programs and routines without line numbers? Impossible! Produce graphics with no FOR-NEXT loops? Absolutely impossible! As for the multiple programs, I had already had more than my share of trouble trying to get one at a time to run.

With the vision of the taped animation firmly fixed in my mind, I delved deeper into the language. Gradually it became evident that Zgrass was different. The commands and syntax seemed to make good sense. Common sense. This was in sharp contrast to the graphic statements with which I was familiar when plotting in Basic.

Fundamental Conceptual Differences

Now that I have had several months to explore Zgrass and implement it under the pressure of deadlines and the budget restraints of my clients, I am more than happy to share what I have already learned about this graphics tool. The concepts upon which this language is built deserve to be discussed before the actual coding structure is introduced. Animation, whether by brush or by computer, is dependent on timing for its dramatic effect. This means that the developmental phase must remain fluid so that fine tuning of the animation can be accomplished.

For instance, it's very difficult to anticipate the effect of an explosion of a space ship in a game. It isn't until the explosion is seen, not once but over and over that the real effect can be felt. Not being able to easily isolate and experiment with individual elements of an animated graphic was one of the major frustrations I experienced while programming in Basic.

Basic tends to be linear by nature. We begin at line number ten (a good safe start) and work our way to the end of the program with side trips in GOSUBs and GOTOs. Programs for the simplest animations can become enormous and complex with FOR-NEXT loops rested inside nested FOR-NEXT loops. Fine tuning is difficult and often results in bugs.

Zgrass, on the other hand, is more modular in concept. Perhaps the difference can be best illustrated by our fictional space game. In Basic we would write one long program containing every element needed to play the game. Any changes would have to be squeezed into the spaces of the long existing lines. Since the program may be several hundred lines long, finding the particular lines that need to be changed can be difficult.

This same game written in Zgrass would have an entirely different structure. Each element of the game would have its own program, called a macro. Each macro would be assigned a name—usually descriptive of its function—that may be used to call the macro when that particular element is needed. For instance, we might have a macro called BUILDSHIP which draws a spaceship. This macro could be called any time a new space ship is needed on the screen—at the beginning, after a crash, after an enemy victory, etc. In Basic, since only one program is in the memory at one time, we enter the command RUN whenever we want the program to execute. In Zgrass we simply enter the macro name to execute it. This can be done from the keyboard or *as a statement in another macro*.

While this is deceptively similar to a standard Basic GOSUB statement there are some very important differences. The first is the ease with which BUILDSHIP is edited. The simple command EDIT BUILDSHIP brings only those lines used to build our spaceship to the full screen editor.

Second, we can execute BUILDSHIP independent of all of the other elements in the space game. There is no need to run the entire game to check on changes. This allows us to focus our entire attention on the details and timing of each element of the game individually.

Third, since Zgrass is modular, this same macro can be used in other games needing a space ship. In Basic, if we wanted to use a subroutine from one game in another, we would normally have to re-enter all the lines through the keyboard. Since Zgrass macros can be saved on tape or disk there is no need to re-enter the shipbuilding routine manually. Simply recall BUILDSHIP and it's ready to use.

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POWER produces a dramatic improvement in the ease of editing BASIC on Commodore's computers. POWER is a programmer's utility package (in a 4K ROM) that contains a series of new commands and utilities which are added to the Screen Editor and the BASIC Interpreter. Designed for the CBM BASIC user, POWER contains special editing, programming, and software debugging tools not found in any other microcomputer BASIC. POWER is easy to use and is sold complete with a full operator's manual written by Jim Butterfield.

POWER's special keyboard 'instant action' features and additional commands make up for, and go beyond the limitations of CBM BASIC. The added features include auto line numbering, tracing, single stepping through programs, line renumbering, and definition of keys as BASIC keywords. POWER even includes new "stick-on" keycap labels. The cursor movement keys are enhanced by the addition of auto-repeat and text searching functions are added to help ease program modification. Cursor UP and cursor DOWN produce **previous** and next lines of source code. COMPLETE BASIC program listings in memory can be displayed on the screen and scrolled in either direction. POWER is a must for every serious CBM user.

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Zgrass, continued...

This modular format is not the only conceptual difference between Basic and Zgrass. While Basic has evolved with the development of more powerful hardware, it isn't usually considered a user expandable language. On the other hand, Zgrass is definitely expandable. Most commands are contained in ROM. However, additional commands can be loaded into memory when needed, and entirely new commands can be created. As a matter of fact, in the few months since I purchased my Datamax, several new commands have been added to the Zgrass library.

The difference that I most appreciate, however, is the concept that the user should have easy access to *all* of the capabilities of the hardware. It is clear from the articles in *Creative Computing* and other computer magazines that this is not a common philosophy. Zgrass seems to open the entire graphics repertoire of the computer for the user. If you have been disappointed by the performance of Basic compared to what you saw in the manufacturer's demonstration then you'll find Zgrass refreshing.

Getting Started

The quality of documentation is usually the first hint about the overall quality of any system. The documentation that arrived with my Zgrass computer system was packaged in two booklets. The first of these is the *Zgrass Glossary of Buzzwords, Commands, Functions, Idiosyncrasies, Swap Commands, Swap Functions, Switches and Esoterica*. The contents are just as thorough as the title.

One of the drawbacks of working with a high level language is that it is possible to do things without ever understanding the basics of computer logic. Truth tables had never really seemed to be worth the effort to learn until I came across the explanations about OR, XOR, and AND in the Zgrass Glossary.

Whoever wrote the glossary appreciates the fact that there are people who want to use a computer but don't want to earn a mathematics degree to do so. The explanations are clear and concise. Often there are short programs that can be entered and run in a few minutes that graphically illustrate the logical operations. All of the entries are in alphabetical order which makes finding them a snap.

The second booklet is a self-teaching guide. I had some troubles with this one—mostly due to my own impatience. I would begin a lesson dutifully reading and working the examples until something would click inside my head—the old "Hey! That was great . . . I wonder if . . ." and off I'd go on with some wild experimentation until I found myself stuck.

Then grabbing the phone I'd make a plea for help, only to find that the answer was two or three pages further along in the book. After doing this two or three times (and receiving the same courteous "It's on page... reply), it finally began to dawn on me that patience really is a virtue. Once that point was reached the self-teaching guide worked fine.

Additional commands can be loaded into memory when needed, and entirely new commands can be created.

The System Supports the Graphics

Simple graphics commands do not necessarily guarantee easy graphics generation and animation. Zgrass commands such as POINT, BOX, LINE and ELLIPSE (an expanded circle command) would certainly be useful in any language; but, Zgrass goes beyond these in providing the tools needed to produce sophisticated graphics easily.

While a complete explanation of the Zgrass operating system is beyond the scope of this article, I just can't resist mentioning some of the features that make the job of the programmer or animator so much more enjoyable.

There are four features that I especially appreciate: the full-screen editor, the sophisticated cassette tape interface, the program flow control commands and the priority execution controls that allow for truly interactive program control.

Perhaps nothing relieves the tedious aspects of programming better than a good full screen editor. Zgrass supports, through the EDIT command, a full screen editor that comes remarkably close to being a true word processor. The cursor can be located using keyboard commands or a joystick. Lines can be altered, deleted, duplicated or moved. Obviously, this speeds up the process of building or modifying a macro.

At first glance, it may seem out of place to bring up a cassette tape interface in a discussion devoted to an easy graphics language. But, the key word is *easy*. Anything that takes the hassle out of programming deserves to be recognized. The Zgrass tape handling system certainly qualifies.

One of the frustrations encountered when using cassette tape with most of the popular micros is that once the computer

Lynn Busby, president of the Computer Station, as seen by the Dithertizer II.

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Dithering. Developed at Bell Labs and MIT, dithering was originally an approach to picture transmission. Compared to other methods, dithering is fast and accurate.

The Dithertizer II was designed for the Apple computer by David K. Hudson, a researcher at MIT. Design goals were high accuracy, fast scanning, maximum reliability and an economical price.

High Quality Images

The resolution is of the Dithertizer is the maximum the Apple can handle in the high-resolution mode, i.e., 280 x 192 (53,760) pixels.

To produce an image, a video camera is focused on the subject. Peripherals Plus furnishes a Sanyo VC161OX camera, a laboratory/industrial unit with an f 1.6 lens. This camera has a focus range of 18˝ (for extreme close ups) to infinity (for distant subjects).

The camera scans an entire frame in 1/60th of a second. Two frames are scanned, of course, in 1/30th of a second. By adjusting the blackness control (with Paddle 0) to any one of 255 levels you can determine the threshold of gray between the two frames.

A 1/30th second, two-frame scan has two levels of gray and produces a high-contrast but quite recognizable image.

Pictures or Contours

Using the "Contour" software routines and contrast control (Paddle 1), it is possible to subtract one image from another. If the blackness thresholds of the two images are close, say 125 and 127, the resulting image will show just the outlines or highlights of an object.

Another possibility is to reduce the contrast to zero which results in a nearly blank screen except for movement in the area scanned. This type of movement detector is much faster (1/30th second) and more precise than other much more expensive systems. It is currently being used to detect and record movement of laboratory animals. It is also used in security installations.

The "Dithering" software routines use the contrast control to divide an image into gray tones. As mentioned above, two levels (usually white and black) result in a high contrast image. Four gray levels provide additional definition while sixteen levels produce a highly detailed image in just over 1/4th of a second. Extremely high detail is possible using the highest 64-gray level setting. At this level, an image is produced in 64/60ths of a second or just over one second. The quality of this image is close to that of a halftone photograph found in a newspaper or magazine.

Using Dithered Images

What can one do with a dithered image? Upon completion it can be stored automatically in either page 1 or 2 of the high-resolution graphics area of the Apple. Hence, it can be printed out on practically any printer. To print it on an Apple Silentype printer or equivalent requires no additional software.

To take advantage of the automatic print routines in the Dithertizer itself does require additional software tailored to a specific printer. Software packages are available at $44.95 each for the following printers: IDS 440, 445, 460, and 560; IP225; Anadex DP9500 and DP9501; Spinwriter 5510 and 5520.

Individual images or series of images may also be incorporated in other programs in the same way that other hi-res graphics are used. Using VersaWriter software, for example, text may be added to images. An image may be shown on the screen while a disk is loading or while the computer is completing a time-consuming calculation in another program.

With the proper software, the Dithertizer can be used to perform image enhancement, to identify features, detect motion, track a moving target or create a detailed picture for display. The possibilities are limited only by your imagination.

Quality Construction

The dithertizer is manufactured to exacting specifications by Computer Station. It consists of the Dithertizer II board which plugs into Slot 7 in the Apple II, a cable which connects between the Dithertizer and motherboard and a 10 foot cable to the camera. The system requires a 48K Apple disk system.

The software package consists of three routines on disk: "Dither" to build a gray scale picture, "Contour" to produce an edge scan using image subtraction, and "Dscan" to store a binary image in either page 1 or 2 of the high-resolution graphics area.

Peripherals Plus also includes a Sanyo VC161OX video camera with external horizontal and vertical sync input.

The components of the packge--hardware, software and camera--are warranteed by the manufacturers against defects in material and workmanship for 90 days. In addition, Peripherals Plus guarantees that if you are not completely satisfied you may return the system for a prompt and courteous refund.

Order Today

The entire Dithertizer system consisting of the Dithertizer board, Sanyo camera, cables and software costs only $650 plus $6 shipping and handling in the continental United States. Customers in other loctions should write for shipping rates. Price for the board and software alone is $300 while the camera alone is $410. To order your system, send payment or Visa, MasterCard or American Express card number and expiration date to the adress below. Credit card customers may also call orders to our toll-free number.

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CIRCLE 239 ON READER SERVICE CARD

Zgrass, continued...

has been instructed to load tape you have no idea what's happening—all you can do is sit and wait—and hope. Zgrass eliminates this problem beautifully by including a file directory system with the PUTTAPE and GETTAPE commands. The syntax for PUTTAPE is:

```
PUTTAPE NUMBER,FILENAME,DESCRIPTION
PUTTAPE 2,FLYINGSAUCERSHOOTER,[Creates a slingshot
for CRASHNSMASH]
```

The NUMBER tells how many times the file should be put on the tape, the FILENAME (which can be any length) is the file to be copied and the DESCRIPTION is anything that helps you identify the file.

GETTAPE FLYINGSAUCERSHOOTER would initiate a search through the tape for the proper file, printing out the directory information of all the files it passes. The directory for our example would look like this:

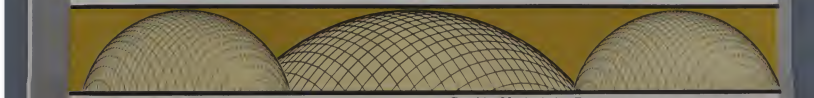
```
STR NAME:FLYINGSAUCERSHOOTER LEN:324 NOTE:
Creates slingshot for CRASHNMASH
```

This directory information plus status messages like BAD DATA and BAD-AUTORETRY save a tremendous amount of programming time. Furthermore, the tape interface is extremely tolerant of random user tape searches. We are constantly skipping back and forth through the tapes with multiple files, using the directories to tell us where we are. The poor man's external random access memory!

follow because subroutines are actually small independent macros which *have names*! In spite of my initial fears, I have found the Zgrass systems for program flow control to be far better than the old FOR-NEXT loops I left behind.

The fourth feature that I appreciate is the ability to run more than one program at a time and assign priority levels to them. If we use .F after a macro name we are saying that this macro has the highest or FOREGROUND priority. If we use .B we are saying that the macro has BACKGROUND priority. It is the BACKGROUND mode that I find most useful. The keyboard remains active while macros are running in the background mode and can even be used to modify the programs as they run. Ever wanted to try out different colors on that hyperspace explosion? You can in Zgrass. Simply run the explosion macro in the background mode and experiment with colors while the explosion repeats indefinitely. This is another example of the superior fine-tuning abilities of Zgrass.

When I first purchased the Datamax UV-1, I was looking for a machine with simple graphics commands. Now I realize that just having simple graphics primitives is not enough. The power of Zgrass begins with the fundamental concepts which underlie the language control structure and moves from there to the commands dedicated to graphics manipulation. The reason that I have placed so much emphasis on these features is that, while I am amazed at the power of some of the graphics commands in Zgrass, I doubt that a linear language with these same commands would be as flexible or easy to use.



The simplicity of the commands used to control program flow in Zgrass, while not actual graphics commands, are a third feature of the the overall operating system that contributes directly to making the job of creating graphics easy.

The most commonly used program flow control features used in Basic are line numbers, GOTO, GOSUB and the ever popular FOR-NEXT loop. As mentioned earlier, Zgrass is conspicuous for the absence of most of these features in normal use. Line numbers and GOTO statements can be used by the programmer, but other means of controlling the flow of the program are so easy and efficient that I have not used a single line number or GOTO statement the entire time I have used the Zgrass language.

The SKIP command is the major program flow control statement. SKIP -2 would tell the computer to go back two lines of code. SKIP 6 tells the computer to go forward six lines. Most often these skips are used in conjunction with an IF statement. The IF statement in Zgrass is far more versatile than it is in Basic. Consider the following comparisons:

```
BASIC:   1910 IF A > 10 THEN 1860
ZGRASS:  IF (A=A-5) > 10,SKIP -5

BASIC:   340 IF A < 10 THEN GOSUB 5000
ZGRASS:  IF (A=A-5) < 10,BUILDSHIP
```

Notice that the Basic IF statement is simply a testing step. The process of arriving at the variable A is performed outside of the IF statement, usually in a FOR-NEXT loop.

In Zgrass the IF statement is used not only for testing conditions, but for performing the actual calculations to test. I hope it is also evident that Zgrass programs are easier to

Graphics Manipulation Features

The function of the graphics primitives POINT, LINE, BOX and ELLIPSE are self explanatory and not so different from some found in newer expanded Basic interpreters. Other commands used to scroll screen areas, create windows and fill bordered areas with solid colors are also fairly common. There are, however, some provisions for manipulating colors, special commands for manipulating picture elements and remarkable picture arrays called "snaps."

Dr. Tom DeFanti, the originator of Zgrass, borrowed a concept from box camera days and allows us to save individual pictures from the screen with the SNAP command (short for snapshot). Suppose we wanted to create a little creature to be used in a game. With Zgrass you would simply draw it on the screen and "snap" it off. The SNAP command saves the creature and the area around it in a box called a "snap array." The SNAP syntax and an example are:

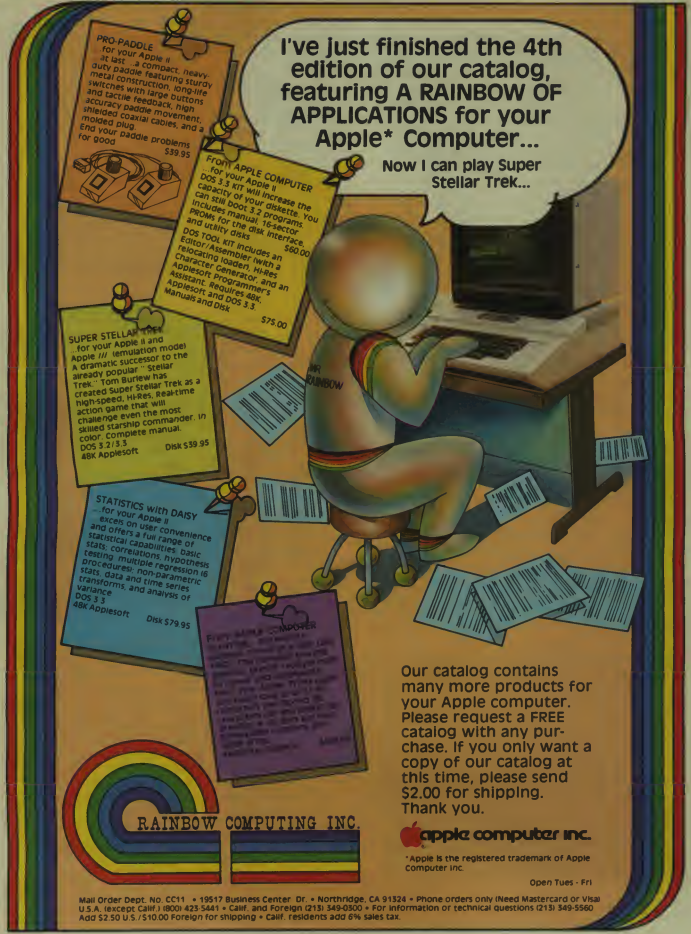
```
SNAP Snapname,Xcenter,Ycenter,Xsize,Ysize
SNAP ALIEN1,0,0,15,25
```

To retrieve our creature from memory and display it on the screen we use the Display command. Its syntax and an example are:

```
DISPLAY Snapname,Xcenter,Ycenter,Displaymode
DISPLAY ALIEN1,50,25,0
```

The SNAP and DISPLAY combinations are the keys to the rapid animation possible with Zgrass. This macro sends an alien with moving legs across the screen.

```
CRAWLYCREATURE=[A=-190
DISPLAY ALIEN1,A,0,0
DISPLAY ALIEN2,A+1,0,0
IF (A=A+2) < 190,SKIP -2]
```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Zgrass, continued...

ALIEN2 would be created by displaying ALIEN1, making the changes to the leg positions and "snapping" it off again with the snapname ALIEN2. By alternating between ALIEN1 and ALIEN2 and moving the display center slightly each time a snap is displayed, we create the appearance that the creature is really crawling. Small snaps can be displayed so fast that you may have to use a timing loop to keep them from being a blur.

Snaps are great. They are fast and easy—no PEEKing or POKEing—just draw and SNAP! Furthermore, they can be manipulated to create a variety of effects. For instance, the PATTERN command lets us fill a bordered area with a pattern of repeated snaps. This is great for fabric design. I have used it to build large brick walls from a small snap of a few bricks. Snaps are central to Zgrass. Each of our three examples relies on snaps as its central graphic element.

Figure 1 is a still representation of an animation showing the space shuttle landing. On videotape the lander would descend, land and roll to a stop. Note the dust which is a snap also.

Figure 2 demonstrates how snaps can be manipulated. Note the various sizes of the dollars. The SCALE command can be used to stretch, squeeze and reverse snaps both horizontally and vertically.

Figure 2. This picture demonstrates a snap being displayed many times on the screen. The SCALE command is used to vary the size of the snap. By Jane Veeder.

The DISPLAY command is greatly enhanced by the rich color manipulation alternatives provided. These include a complete color filtering system, as well as, automatic OR, AND and XOR. I never really understood these logical operations before working in Zgrass; they seemed far too complicated to be bothered with. Now, I couldn't get along without them. Not only are they useful for dramatic effect, but they save programming time. If we were to program a football game only one team would have to be drawn. The other would be a duplication of the first using the XOR mode and color filters.

The weather map in Figure 3 demonstrates how the color filters can be used. The color filters trim away unwanted colors when snaps are displayed. Notice that the snaps at the bottom of the screen (sun, clouds, etc.) each have a colored border area. Obviously, that border would be unacceptable on the map so the special display mode color filters are used to eliminate it. By the way, this picture (and Figure 1) illustrate user-defined typefonts made possible in this versatile language.

Figure 1. Video animation of the Space Shuttle landing by Jane Veeder.

Figure 3. This picture shows a menu-driven program to place weather symbols on a map. This program makes use of the special color filters provided by Zgrass. By Copper Gilroth.

Conclusions

The ability to draw points, lines, boxes, and even circles in color doesn't guarantee fast, easy animated graphics. Now that I have had the opportunity to work with Zgrass and compare it with Basic, I realize that the underlying concepts and language structure are the most important elements for truly easy graphics generation. Zgrass has been a pleasure to use. It is faster and far easier than Basic to learn and implement. Best of all, it gives me access to graphics power that had always seemed elusive before.

For me, the bottom line is cost-effective animation for professional video production. For others, it may be faster paced and more realistic games or more effective computer aided instruction. If your application involves graphics—particularly real-time animation—then Zgrass deserves a good hard look. □

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CIRCLE 170 ON READER SERVICE CARD

Among the software to cross this desk recently are several new games for the Apple II. They are all worth covering, though each might appeal to a different section of the Apple community.

A Shoe In the Works

On-Line Systems has done it again with *Sabotage*, a highly captivating game that will put blisters on anyone's paddle finger. The player has a small cannon at the bottom of the screen. Aiming and firing can be controlled either through a paddle or the keyboard. The player attempts to defend his cannon against helicopters that drop parachutists, and against planes that drop bombs. If enough saboteurs reach the ground, they destroy the cannon in a very amusing manner. If a bomb lands, the cannon is blown to pieces. The player has the option of using steerable shells which curve as the cannon is rotated. With paddle control, a stream of shells can be fired by holding the button down.

If the game sounds too easy, add the fact that each shot costs a point. The player can hose the helicopters with a stream of shells, but that strategy won't contribute much to his score. Once saboteurs reach the ground, they can't be shot. But there is a way to get rid of them. If the parachute is shot away from an attacker in the air, he will fall to the ground with a splat. A saboteur unfortunate enough to be beneath the plummetting paratrooper will be eradicated. The game starts out at an easy pace with just one or two helicopters on the screen at any time. After a while, the planes appear. When the helicopters return, they drop more saboteurs. The shrapnel from struck helicopters can wipe out other helicopters or paratroopers, and it's possible, in this way, to get two or three helicopters with one shot.

The game keeps track of high score during individual runs, but doesn't store the high score on disk. *Sabotage* is a very good game with fine graphics and high replayability.

creative computing

SOFTWARE PROFILE

Name: Sabotage
Type: Arcade Game
System: 48K Apple, Disk Drive
Format: Disk
Language: Machine Language
Summary: Excellent game
Price: $24.95
Manufacturer:
On-Line Systems
36575 Mudge Ranch Rd.
Coarsegold, CA 93644

Sabotage.

On the Circuit

International Gran Prix Racing is everything an Apple game should be, and more. Written by Richard Orban, who created *Three Mile Island*, it is one of the few driving games that successfully solves the paddle problem. Namely, how can a player shift, accelerate, decelerate, and steer without getting hopelessly tangled in a jumble of paddles and keys? The solution in *Gran Prix* is absolutely elegant. The player uses only one paddle. The paddle controls steering. If the button is held, the car accelerates. If the button is quickly released and pressed, the car will shift to the next gear, assuming high enough engine revs have been reached. Releasing the button causes the car to decelerate. During deceleration, a press and release of the button is used for downshifting. If the player desires, he can switch to automatic transmission. There is even a cruise control.

creative computing

SOFTWARE PROFILE

Name: International Gran Prix
Type: Road race game
System: 48K Apple, Disk Drive, Paddles
Format: Disk
Language: Machine Language
Summary: Best road race on the market
Price: $30
Manufacturer:
Riverbank Software, Inc.
Smith's Landing Road
P.O. Box 128
Denton, MD 21629

All this merely scratches the surface of an excellent game. The program is basically a road race game, similar to the arcade game *280-ZAP*, where the screen displays roadposts flashing by the car. The icing on the cake comes in the form of five Gran Prix courses. At the start of the game, the player selects a course, then chooses the number of laps he wants to drive (from 1 to 10). Next, the amount of fuel is selected, followed by the skill level.

International Gran Prix.

There are eight levels. At the easiest, the car barely drifts; in middle levels, it skids; at the top level, the road turns to Teflon.

The dashboard display includes speedometer, tachometer, a timer for current lap and total time, and indicators showing the relation of the tires to the posts. Whenever the car moves dangerously close to the posts, a clicking warns the driver. Collisions are accompanied by a weird sound that seems to defy the limitations of the Apple speaker. The player's best lap time and total time for any course and skill level are stored and displayed by the game. All the curves have names, and these names are displayed on the screen when the car approaches.

Beyond great graphics and superb design, the game also simulates driving with nearly total realism. Whatever algorithms the author used, he did a good job. The car handles very accurately. It can accelerate through curves, go into controlled skids, and fishtale if the player oversteers. *Gran Prix* is a winner.

That Familiar Glow

Fighting its way through the plethora of Missile Command clones, *Norad*, from Western MicroData, emerges as a new twist on the theme. The player has a hi-res map of the good old U.S.A., dotted with ten cities and ten missile bases. Each base has a number. Press that number on the keyboard and a missile leaves the base. The arrow keys control the horizontal motion of the missile. The space bar detonates the missile. If it is detonated close to an incoming warhead, all is well. If not, the warhead hits a city or a base. Cities hit twice are destroyed. Bases are wiped out with one hit. At intervals throughout the game, the cities are rebuilt, and any eradicated bases near a surviving city are replaced. The surviving cities also stock the silos with extra missiles. Silos start with ten missiles. The player receives bonus points for unused missiles.

Norad.

There are three skill levels. Higher levels start with faster attacks, and throw more waves of attack at the player. On each level, the player wins if he survives a specific number of waves. At a certain point, the player is also given an MX missile site which can be moved across the map. The lowest skill level is good for learning the game. The highest level is very tough.

Raiders of the Lost Star

Strongly resembling a certain Atari classic, *Space Raiders* is a search-and-destroy game. Using a joystick or keys, the player moves through galactic quadrants, blasting enemy ships. The strong point of the game is the motion of the stars. The field moves toward the player and shifts realistically when he turns. The question is whether to compare it to the Atari version, or to view it as a game in itself. By comparison, it just doesn't offer the same graphics or sound. What works for the Atari won't necessarily work on the Apple, and vice versa. As a game, it is interesting, but rather repetitive. Only one ship attacks at a time. Basically, the player goes into a sector, destroys all the enemy ships, goes into the next sector, and so on. The player can also dock at a starbase when he needs more energy. The target has to be in the center of the crosshairs to be hit, adding a bit of difficulty to the game. If Atari Star Raiders appeals to you, this is as good a version as is likely to be produced for the Apple.

creative computing
SOFTWARE PROFILE

Name: Norad
Type: Arcade Game
System: 48K Apple, Disk Drive
Format: Disk
Language: Machine Language
Summary: Defend the U.S.A. against missiles
Price: $27.50
Manufacturer:
Western MicroData
Enterprises, Ltd.
P.O. Box G33,
Postal Station G
Calgary, Alberta, Canada T3A 2G1

creative computing
SOFTWARE PROFILE

Name: Space Raiders
Type: Space Fight
System: 48K Apple, Disk Drive
Format: Disk
Language: Machine Language
Summary: Apple version of Star Raiders
Price: $29.95
Manufacturer:
United Software of America
750 3rd Ave.
New York, NY 10017

Treking On

Rainbow has made improvements to *Stellar Trek* (reviewed Oct., 1980), producing *Super Stellar Trek*. The game offers a hi-res, real-time fight against Klingons and other baddies. The most obvious improvement is the elimination of constant disk access. In the original version, the program went to the disk after every command. Now, the routines remain in RAM, speeding up play and lowering disk wear. The first time a user plays the game he is asked to name all the officers. From then on, this information is used to add color to the game, with reports coming to the bridge from the officers.

creative computing
SOFTWARE PROFILE

Name: Super Stellar Trek
Type: Spacefight simulation
System: 48K Apple, Applesoft, Disk Drive
Format: Disk
Language: Basic
Summary: Good Trek game
Price: $39.95
Manufacturer:
Rainbow Computing, Inc.
19517 Business Center Dr.
Northridge, CA 91324

Overall play is in the basic StarTrek format; the player has a limited amount of time in which to find and destroy the Klingons, using photon torpedos and phasers. Extensive commands are available for such exotic actions as mining dilithium crystals. Those who enjoy Trek games will like this one.

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CIRCLE 303 ON READER SERVICE CARD

Ashes to Apples

An arcade game dealing with a certain mythical bird has found its way to the Apple in the form of *Falcons*. The game seems fairly easy for the first ten seconds or so. Several rows of ships move above the player, firing down at his base. This part is reminiscent of Invaders. Then a few ships break formation and swoop down. Now it seems a bit like Galaxian. The similarity vanishes as the attacking ships begin to fly in strange patterns, moving below the screen and attacking the player from below. A transformation suddenly occurs. The ship changes to a falcon and flies evasive patterns. It's worth more points now, but harder to hit. If the player clears the field, he gets another with a different formation. After this second field is cleared, the hard part begins. Small blue dots appear on the screen, weaving back and forth.

creative computing
SOFTWARE PROFILE

Name: Falcons
Type: Arcade Game
System: 48K Apple II or Apple III, Disk Drive
Format: Disk
Language: Machine Language
Summary: Superb and challenging game
Price: $29.95
Manufacturer:
Picadilly Software
89 Summit Ave.
Summit, NJ 07901

They start to grow, becoming large dots, then huge falcons. They swoop at the player, moving at high speed. If hit straight on, the falcon is destroyed. If only winged, it returns. If the player gets through this field without losing his allotment of three ships, he gets a second field of dots that grow into falcons. Survivors are given a chance to destroy the mother ship. Make that MOTHER SHIP. The thing is huge.

Attacking the mother ship in Falcons.

To destroy it, the player first has to blast a hole through the bottom. Next, a hole has to be made in a revolving rim. Once there is a clear path for a shot to the inside, the ship can be destroyed. But the mother ship shoots back. And groups of small ships hover above it, swooping down on the player. If the player destroys the mother ship, the game cycles back through the five levels again.

Beside firing, the player has the option of using shields. A shield lasts for about four seconds, then can't be used again for about five seconds. Shields are great for destroying swooping falcons since the birds are killed on contact with the force field. The game can be played with keys, paddles, or a joystick. There was one rough edge noticeable when fighting the mother ship. Occasionally, one of the attackers wouldn't be entirely erased from the screen when destroyed. But this barely detracts from the appeal of the game. *Falcons* is tough, fun and very well done.

Killer Robots, Drones, and Low-Life Storm Troopers

Mission Escape arrived here two days ago and has already taken control of the staff. They've been lining up to play this one. It is a cross between the arcade game, *Berzerk*, and some high-adrenalin contest that might be thought of as death chess. The player starts at one of four doors to a room containing robots, drones, and storm troopers. His object is to get to the specified exit, and thus, to the next level. The storm troopers fire lasers that do damage to the player's armor. The drones also fire lasers but, if shot, explode with enough force to destroy anything adjacent to them. The robots fire missiles that always kill with one shot. Against this arsenal, the player has three weapons. He can fire a laser, fire a burst of three laser shots, or fire a missile. The missiles and rapid-fire bursts are limited, single laser shots are unlimited.

creative computing
SOFTWARE PROFILE

Name: Mission Escape
Type: Strategy and Action Game
System: 48K Apple, Applesoft, Disk Drive
Format: Disk
Language: Machine Language
Summary: Highly replayable game
Price: $24.95
Manufacturer:
CE Software
801 73rd. St.
Des Moines, IA 50312

Mission Escape.

The player and the enemy alternate turns. The player has ten seconds to issue up to three orders. Movement and firing are controlled from the keyboard. While some keyboard-controlled games are unexciting, *Mission Escape* is definitely not dull. Despite the alternation of turns, there is a real-time feel to it. As an extra touch, the top five scores are kept on the disk. *Mission Escape* is highly recommended.

It Isn't Raining Rain

Finally, in an attempt to make up for not reviewing it sooner, one more game deserves mention in this roundup. *Alien Rain* pits the player against a swarm of hovering, swooping attackers. They start out placidly enough, just moving back and forth across the top of the screen, letting the player pick them off with his ship. Then one or more of the critters comes swooping down, flying a drunken path and raining missiles. Attackers that make it to the bottom wrap around to rejoin the formation at the top. There are two flagships that are worth bonus points if shot while swooping. If the player clears the board, he gets another screenful. If he scores 3000 points, he gets an extra ship.

creative computing
SOFTWARE PROFILE

Name: Alien Rain
Type: Arcade Game
System: 48K Apple, Disk Drive
Format: Disk
Language: Basic
Summary: Tough and fast moving
Price: $24.95
Manufacturer:
Broderbund Software
Box 3266
Eugene, OR 97403

The animation here is very smooth, and the game is tough enough for most players. For those who have it mastered, Broderbund also offers *Alien Typhoon* with more aliens and faster action. □

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A Tourist's Guide to the Cybernetic Tower of Babel

George Blank

The whole earth had one language and few words... Then (men) said. "Come, let us build ourselves a city, and a tower with its top in the heavens..." And the Lord came down to see the city and the tower, which the sons of men had built. And the Lord said, "They are one people, and they have all one language; and this is only the beginning of what they will do; and nothing that they propose to do will now be impossible for them. Come, let us go down and confuse their language, that they may not understand one another's speech." So the Lord scattered them abroad from there over the face of all the earth, and they left off building the city. Therefore its name was called Babel (confusion), because there the Lord confused the language of all the earth. (Genesis: Chapter 11.)

According to this Bible story, mankind was given different languages to prevent us from joining together and developing enough power to rival God. Perhaps we have developed the many computer languages to keep the computers from joining together and developing enough power to rival mankind? It is virtually certain that a single good computer language that could be used in any computer without modification would vastly extend the range of what we now do with computers.

There have been many attempts to construct a universal computer language, and I suspect that anyone who has developed a good language could be tempted to wish that it could be universally available. However, it is doubtful that there will ever be an ideal computer language.

Every language has its own design objectives, which usually means that the particular language is ideal for some purposes and inappropriate for others. As a result, most present languages have passionate advocates and equally vehement enemies. Basic, as the most widely used computer language today, probably has the largest and most passionate groups of defenders and detractors.

The reason there is no such thing as the best computer language is that there is no possible way to agree on what the best language should do. Some languages are ideal for the program developer. For example, APL allows rapid and easy development of an application program. Other languages are easy to maintain. The structure of Pascal makes it easy for a programmer to understand what is going on in any particular module, and to make changes as necessary. Basic is popular because it is widely available, can be used in a computer with limited memory, and is not difficult to learn. Therefore manufacturers build it into their computers and programmers write application programs in it. The very characteristics that make some languages ideal for certain applications make them unsuited for other uses.

One way to gain understanding of the strengths and weaknesses of different languages is to write the same program in several different languages. To a certain extent, this is unfair, as any conceivable problem would be well suited to some languages and poorly suited to others. No one problem is likely to demonstrate the real strengths of even two different languages.

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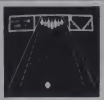

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Tower of Babel, continued...

I have prepared a series of programs to illustrate the differences among popular languages in three areas; console input, console output, and common arithmetic. No attempt has been made to polish the programs. In fact, in some of these cases, the program shown is only my second or third program in that language. Except for the Logo and Lisp examples, developed on an Apple II, and the Cobol program which was written by Eric Wolcott of Creative Computing Software, the programs were developed and tested on a Model I TRS-80 microcomputer.

The Problem

Prompt the user and accept two numbers. Display the numbers on the console, calculate the average of the two numbers, and display that as well.

Basic

A Basic language solution to the problem is shown as Listing 1. Basic actually has many advantages as a language for a microcomputer. It is relatively compact, so it does not require much memory. There is now a single computer chip, the Z-8, which has Basic built right in. Because Basic uses standard English words like "PRINT," it is not difficult to learn or to understand. Many special features are available for graphics and file handling. It is easy to connect Basic to machine language subroutines which do things for which Basic is not well suited. As an interpreted language, it is easy to develop programs and test modules while one is writing them. At the same time, compilers are available to increase the speed and security of programs written in Basic.

The most popular version of Basic for microcomputers is Microsoft Basic, which is now available for the Pet/CBM, Apple, TRS-80, Atari, and other popular computers. Microsoft Basic is actually a family of similar languages, ranging from a rather limited version for the Pet to a sophisticated version with many extra features for Atari and CP/M based computers. Applesoft and TRS-80 Level II and Disk Basic fall in between.

There are also several Basic compilers available. Some of them, such as the Basic Compiler from Microsoft, compile completely to machine code. However, most compiled languages require a set of copyrighted routines, called a run-time package, in order to work. While these are usually compiled right into the program, they do pose a problem for someone wishing to sell compiled programs. The company that owns the copyright on the run-time package usually wants a royalty on each copy sold.

I used Accel II, a partial compiler that does not require a license fee for the run-time package, to compile a text processing program I wrote to insert typesetting control codes into my articles. The original was too slow, taking 18 minutes and 20 seconds to process a sample file. After compiling the program with Accel II, it processed the same file in 1 minute and 58 seconds.

Listing 1. Basic program to average two numbers.

```
10 CLS
20 INPUT "Type a number and press ENTER"; A
30 INPUT "Give me another number"; B
40 PRINT
50 PRINT "Your numbers are "; A; " and "; B
60 PRINT
70 PRINT "The average is "; (A + B) / 2
80 PRINT
```

Pascal

Pascal is often touted as the language that will replace Basic. The major advantage of Pascal is its modular structure. It practically forces the programmer into good programming habits, which tend to pay off in programs that are easier to debug and modify. Pascal also allows recursive programming, allowing a subroutine to call itself. Another advantage is the ability to use local variables, eliminating conflicts between variables so familiar to Basic programmers. A Pascal solution to our programming problem is shown as Listing 2.

Listing 2. Pascal program to average two numbers.

```
PROGRAM AVERAGE (INPUT, OUTPUT);

VAR ONE, TWO : REAL;

BEGIN
    WRITELN('Type a number and press RETURN');
    READLN(ONE);
    WRITELN('Give me another number');
    READLN(TWO);
    WRITELN;
    WRITELN('Your numbers are ',ONE,' and ',TWO);
    WRITELN;
    WRITELN('The average is ',(ONE + TWO)/2.0);
END.
```

The only popular Pascal that really rivals its Basic competitor in features is Apple Pascal. It has excellent graphics features, text enhancements, and input/output routines. Unfortunately, it also adds at least $500 to the cost of an Apple II Plus. I have three different versions of Pascal for the TRS-80. The UCSD Pascal from FMG Corporation is a complete development system that requires three disk drives. It has been withdrawn from sale, but FMG does offer Pascal/MT, a version that compiles to machine code, for CP/M systems, including TRS-80 CP/M.

Radio Shack sells their Tiny Pascal, at the other end of the spectrum. Two versions are included, one each for 16K and 32K of memory. Both are cassette based. Tiny Pascal is more of a toy than anything else. I found difficulty in following several Pascal textbooks due to the limitations and non-standard functions of the language. However, it is a good way for the person with only a 16K TRS-80 to experiment with Pascal.

In between the other two TRS-80 Pascal versions is Pascal 80 from Ramware. It has a reasonably complete Pascal syntax with several useful extensions. Accuracy of 14 digits on real numbers makes it quite useful for serious applications. The editor is easy to use and the compiler is fast. While both of the other versions give very specific numerical error messages, I hate to look up the codes and prefer the more limited set of English messages (with an arrow pointing to the probable error) in Pascal 80. The manual is limited to 14 small pages, but the language is close enough to standard Pascal to use standard textbooks. After trying out all three versions, I found myself using Pascal 80 exclusively. It only requires a single disk system, and is very tightly coded to conserve memory, leaving about 24K in my 48K system.

APL

My favorite second language is APL 80, a version of APL by Phelps Gates, the author of Pascal 80. APL is a marvelously simple and compact language, as shown by the program in Listing 3. It is an interpreted language, not a compiled language like Pascal. The line numbers are generated by the language, so all the programmer has to do to write a message on the screen is enclose the text in single quotes. The functions are almost all single characters, although some may look strange. For example, the box in lines 2 and 4 is called a "Quad," and tells APL to get an input from the console. The back arrow tells APL to assign the number input to a variable, ONE in line 2 and

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Listing 3. APL program to average two numbers.

```
0:    AVERAGE ;A ;B
1:    'Type a number and press RETURN'
2:    ONE ← ⎕
3:    'Give me another number'
4:    TWO ← ⎕
5:    ' '
6:    'Your numbers are:'
7:    ONE ,TWO
8:    ' '
9:    'The average is ';(ONE +TWO ) % 2
```

Listing 4. Forth program to average two numbers.

```
: AVERAGE CR
." Type a number and press RETURN " $IN CR
." Give me another number " $IN CR
." Your numbers are " OVER OVER . . CR
." The average is " + 2 / . ;
```

Listing 5. Fortran program to average two numbers.

```
00100    C      AVERAGE TWO NUMBERS
00200           REAL ONE, TWO, AVG
00300           WRITE(5,5)
00400    5      FORMAT(' TYPE A NUMBER AND PRESS ENTER ')
00500           READ(4,10) ONE
00600    10     FORMAT(F7.0)
00700           WRITE(5,15)
00800    15     FORMAT(' GIVE ME ANOTHER NUMBER ')
00900           READ(4,10) TWO
01000           WRITE(5,20) ONE, TWO
01100    20     FORMAT(' YOUR NUMBERS ARE',F7.0,' AND ',F7.0)
01200           AVG=(ONE + TWO)/2
01300           WRITE(5,25) AVG
01400    25     FORMAT(' THE AVERAGE IS ',F9.1)
01500           END
```

Listing 6. Cobol program to average two numbers.

```
 ID DIVISION.
 PROGRAM-ID. AVERAGE.
 AUTHOR. Eric F. Wolcott.
 INSTALLATION. Creative Computing.
 DATE-WRITTEN. 8/9/81.
 DATE-COMPILED.
*
 REMARKS: This program will read in two numbers A & B, and
          determine their average. It will print out the
          two numbers and their average.
*
 ENVIRONMENT DIVISION.
 CONFIGURATION SECTION.
 SOURCE-COMPUTER.      TRS-80.
 OBJECT-COMPUTER.      TRS-80.
 INPUT-OUTPUT SECTION.
 FILE-CONTROL.
 DATA DIVISION.
 FILE SECTION.
*
 WORKING-STORAGE SECTION.
 01 A           PIC  S9(9)V9(5) COMP-3 VALUE  0.
 01 B           PIC  S9(9)V9(5) COMP-3 VALUE  0.
 01 AVERAGE  PIC  S9(9)V9(5) COMP-3 VALUE  0.
 01 DISPLAY-A          PIC ---,---,---.9(5) VALUE  0.
 01 DISPLAY-B          PIC ---,---,---.9(5) VALUE  0.
 01 DISPLAY-AVERAGE  PIC ---,---,---.9(5) VALUE  0.
*
 PROCEDURE DIVISION.
*
     DISPLAY "Type a number and press RETURN" UPON CONSOLE.
     ACCEPT A FROM CONSOLE.
     DISPLAY "Give me another number" UPON CONSOLE.
     ACCEPT B FROM CONSOLE.
     MOVE A TO DISPLAY-A.
     MOVE B TO DISPLAY-B.
     DISPLAY "Your numbers are " UPON CONSOLE.
     DISPLAY DISPLAY-A " and " DISPLAY-B UPON CONSOLE.
     COMPUTE AVERAGE = (A+B)/2.
     MOVE AVERAGE TO DISPLAY-AVERAGE.
     DISPLAY "The average is " DISPLAY-AVERAGE UPON CONSOLE.
     GOBACK.
```

TWO in line 4. APL does not restrict the length of variable names, and every character is significant.

If Pascal encourages good programming habits, APL encourages bad ones, especially the writing of incomprehensible code. I constantly find myself writing quick and dirty code in APL, partly because it is so easy and partly because every program statement must be complete on one screen line. APL is so easy to learn that APL 80 comes with a self teaching course in the language on the diskette. Since the TRS-80 does not allow the standard APL character set, APL 80 substitutes lower case characters, a compromise that purists find intolerable, and which can lead to confusion when following the textbooks.

Forth

Many computer languages turn their advocates into passionate missionaries for the cause, but few seem as fervent as the Forth fanatics. Ted Nelson, our former editor, is an enthusiastic user of Forth on his Atari. I do not have a version of the language, and have only experimented with it briefly under the tutelage of Dick Miller, who with his wife Jill is the author of MMS Forth for the TRS-80. I liked the language when I used it, and if the mandatory licensing fee didn't make it so impractical for program development, probably would be a convert myself. Jill Miller wrote the program in Listing 4.

Forth compiles itself as it goes along into commands which can in turn form the building blocks for subsequent commands. This makes it rather easy to develop powerful routines which are easily transportable from one program to another. Forth is not far removed from machine language, and is therefore very fast.

Fortran

Fortran is a very fast compiled language normally used for batch processing of large quantities of data. It is probably not suitable for the interactive use common with microcomputers. The extensive and cumbersome formatting that can be seen in Listing 5 does allow the Fortran compiler to create memory-efficient final code, but it creates a great deal of work for the programmer.

Fortran also suffers from age. A quarter of a century ago it was a major step forward in simplifying the solving of mathematical problems. However, the vast majority of research into languages has come since the development of Fortran, and many advances in language design cannot be added onto Fortran.

Cobol

Upon first glance at Listing 6, Cobol appears to be a complex joke. In a small computer, it probably is. The long keywords and complex introduction eat up too much memory for a microcomputer.

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```
average {
    int one, two
    pl "Type a number and press RETURN "
    one = gn
    pl "Give me another number "
    two = gn
    pl " "
    pl "Your numbers are";
    pn "one;
    pl " and ";
    pn two
    pl " "
    pl "The average is ";
    pn ((one + two) /2)
}
```

Listing 7. Tiny C program to average two numbers.

and are usually unnecessary in most applications suitable for small computers. However, Cobol is a good language for a major business application. The thorough documentation and easy readability are an asset in a complex program. While we were promised a version of Radio Shack's new Cobol, it did not come in time to allow us to test this program, so the sample program has not been run in a microcomputer.

Tiny C

Our example in Listing 7 really does not capture the flavor of C, as all input and output in the language is done with functions, not native commands. C is a versatile general purpose programming language that was developed at Bell Telephone Laboratories. AT&T is one of the world's largest users of computers, and they even manufacture some of the computers they use. They have developed a microprocessor specifically for the C language. C is popular in both universities and industry, and the powerful computer operating system UNIX was written in C.

Logo

Logo is similar to C in its structure and environment. Both, build on understandings gained with Basic, are well structured, and use the same environment for both programming and execution. Logo is an interactive, procedural language like Forth and APL, which encourages the building of complex functions by combining simple

Languages Available for Some Popular Computers

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Atari	32K D $90 (2)				
PET CBM	Included				
TRS-80 Model I	Included	16K C $45 (7) 32K D $75 (7) 48K D $150 (16)	16K C $20 (16) 48K D $100 (15) 48K CPM 2D $250 (6)	32K D $40 (15)	48K 2D $100 (15) 48K 2D $100 (12)
Heath H8, H89	32K D $175 (8)	40K 2D $250 (8)			40K 2D $175 (8)
CP/M		48K D $395 (12)	56K 2D $475 (6) 56K D $225 (11)	48K D $500 (11)	48K 2D $500 (12)

Computer	Cobol	C, Tiny C	Forth	Lisp	Pilot
Apple II (Softcard)	48K 2D $750 (12)	32K D $150 (11)	48K D $50 (10) 24K D $50 (17)	48K D $125 (4) 32K D $100 (13)	48K 2D $150 (1) 48K D $100 (9)
Atari			40K D $80 (14)	48K D $150 (4)	16K (ROM) $90 (2)
PET CBM		32K C $100 (5)			
TRS-80 I	48K 2D $199 (16)	16K C $100 (18) 32K D $100 (18)	16K D $130 (20) 16K C $90 (20)		
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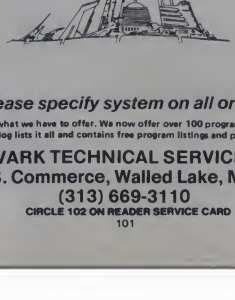

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OSI

Tower of Babel, continued...

```
TO TYPEIN
 OUTPUT FIRST REQUEST
END

TO AVERAGE
 PRINT "
 PRINT [TYPE A NUMBER AND PRESS RETURN]
 MAKE "ONE TYPEIN
 PRINT [GIVE ME ANOTHER NUMBER]
 MAKE "TWO TYPEIN
 PRINT "
 PRINT [YOUR NUMBERS ARE]
 PRINT SENTENCE ( :ONE [AND] :TWO )
 PRINT "
 PRINT [THE AVERAGE IS]
 PRINT ( :ONE +:TWO ) / 2
 PRINT "
END
```

Listing 8. M.I.T. Apple II Logo program to average two numbers.

procedures into larger ones. Although Logo is a powerful and flexible general purpose language, it has been successfully used in teaching programming concepts to even young children. Logo is currently available for the TI 99/4, and will shortly be available for the Apple II.

Our example in Listing 8 is somewhat awkward and unrepresentative of Logo, as the use of holding variables is somewhat foreign to the language. A more typical Logo program to average two numbers is this one, taken from a forthcoming book by Hal Abelson of M.I.T.:

```
TO PAVERAGE :X :Y
 PRINT (:X  :Y) / 2
END
```

In a normal Logo environment, the user would enter something like:

```
PAVERAGE 100 150
```

and the computer would reply:

```
125
```

This style of operation is also typical in APL, where the program:

```
0: PAVERAGE ;A ;B
1: (A + B) / 2
```

would function in exactly the same way.

Lisp

As Listing 9 shows, Lisp is not very well suited to handling numbers. The strength of the language lies in its ability to redefine itself dynamically, treating all present contents of memory including the "program," as data. Normally, self-modifying code is a programmer's nightmare, but this feature is probably ideally suited to creating a relational data base because Lisp can examine and relate the data it is working on to other data. Lisp is popular

Sources of Computer Languages for Popular Computers

(1) Apple Computer
10260 Bandley Drive
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Fortran, Pilot

(2) Atari, Inc.
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(408) 745-2000
Microsoft Basic. Pilot ROM cartridge

(3) Codeworks
Box 550
Goleta, CA 93116
Codeworks C (CP/M)

(4) Datasoft
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Lisp 1.7 (Apple II), InterLisp 2.0 (Atari)

(5) Eastern House Software
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Tiny C (Pet/CBM) Cassette $50, Manual $50

(6) FMG Corp.
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```
(DEFINEQ GETNUM
    (LAMBDA NIL
        (PROG (NUM)
            LOOP
                (SETQ NUM( READ))
            (COND ((EQ (# NUM) NIL)
                (PRINT 'NOT-A-NUMBER)
            (GO LOOP))
            (T (RETURN NUM)))))
(DEFINEQ AVG
    (LAMBDA NIL
        (PRINT '(ENTER TWO NUMBERS))
        (PRINT
            (/
                (+ (GETNUM) (GETNUM))
            2))))
```

Listing 9. Lisp program to average two numbers.

```
T: TYPE A NUMBER AND PRESS RETURN
A: I
T: GIVE ME ANOTHER NUMBER
A: J
T: YOUR NUMBERS ARE #I AND #J
C: I+J
C: ZJ
C: J+2
C: ZK
*NUM
C: I-J
C: K+1
J(J>J):NUM
J(I=J):NUM
T: THE AVERAGE IS #K
E:
```

Listing 10. Pilot program to average two numbers.

in artificial intelligence research because the redefinition allows the program to be set up to learn from experience.

Pilot

Last, and in my personal bias, certainly the least among languages is Pilot. Pilot was designed for educational use, and seems to assume that a language for teachers must be extremely simple. As a former teacher, I do not like the implication that teachers are not capable of learning better languages. I am also predjudiced against the use of the computer for drill and practice, and Pilot is primarily useful for exactly that. The commands are single letters like T for type and M for match, followed by a colon and the operator. Instead of variables, Pilot has "counters." The version of Pilot I used for Listing 10, no longer available and mercifully forgotten, did not even have division, so I had to divide by repeated subtraction, using a counter to determine how many times 2 could be subtracted from my total. Apple Pilot, the best current microcomputer Pilot of which I am aware, is much more complete.

Conclusion

This trip through ten languages has been conducted for tourists. It is not an attempt to provide a detailed description of the different languages. The sample problem was chosen to illustrate three important functions in an interactive microcomputer environment; console input, console output, and simple calculations. There are many other considerations to choosing a programming language for a particular task. The reader is encouraged to choose the languages which stimulate interest and study them further. □

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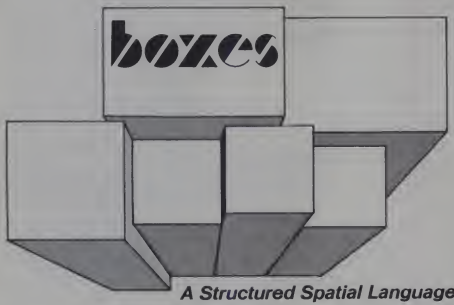

A Structured Spatial Language

George Arthur Miller

Languages are used to communicate ideas. Until the advent of computers most languages were "natural," such as English or French. Pre-computer examples of "artificial" languages are musical notation and mathemetical symbology.

Readers of *Creative Computing* are, no doubt, familiar with one or more popular computer languages such as Basic or Pascal which are used to communicate procedures or algorithms to a computer. Boxes is a simple language used to communicate how a particular space is to be segmented. Although Boxes can be extended to three dimensions or more, we shall describe only the two dimensional version.

The motivation for developing Boxes came from the need to build a general purpose output routine for a computer calendar. We have a machine which can print text and lines. We wanted the text and lines arranged on a page to look like a standard monthly calendar with Monday, Tuesday, etc. along the top and little boxes for each day. We also wanted a weekly calendar and a daily schedule of activities. Knowing we couldn't please everyone with just one format we designed Boxes to allow us to describe quickly any layout of lines and text on a page.

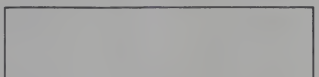

Figure 1.

There are other languages, such as Xerox's FDL, which accomplish the same goal. What makes Boxes unique is the relative nature of its descriptions. Instead of describing a line or box in page coordinates, each box is described in relation to another box.

Consider a page of blank paper. This page can be divided into two horizontal boxes. The bottom box can be divided into three vertical boxes, and so on. The entire page can be progressively segmented into smaller and smaller boxes until we arrive at an atomic box. An atomic box cannot be further segmented and has two characteristics, a border and text.

An atomic box can have any combination of its top, bottom or sides drawn. In addition, the box can contain written text. A non-atomic box can be segmented horizontally or vertically by any number of subboxes in any proportion of heights or widths. For example, how would we describe the figure in Figure 1?

The page is divided horizontally into two boxes. The top box is six times as high as the bottom box. The box is further segmented into three boxes of equal width, each containing a person's name. This is the English description of the page layout. The same description in the Boxes language is:

```
H 6,1
  [ ]F
  V 1,1,1
    [Sue]F
    [John]F
    [Harry]F
```

Notice there are two non-atomic boxes and four atomic boxes. The atomic boxes are easy to recognize since they have square brackets around the text and are followed by the letter "F." The non-atomic boxes start with either a horizontal or vertical segmentation. The numbers fol-

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lowing the H or V indicate not only into how many boxes the non-atomic box is to be segmented but also in what proportion. So, the "H 6,1" says "divide me horizontally into two boxes with the top box taking 6/7th of the available space and the bottom box taking 1/7th of the available space."

Spaces and indentation are ignored by the computer (except within the square brackets) and are included only to make it easier to read. The letter "F" at the end of each box indicates the full border is to be drawn around the atomic box. A zero means no border is to be drawn. Any combination of sides around the box can be drawn by following the square brackets with some hexadecimal digit 0-F. Assume the following assignments of values:

To draw just the top and bottom of a box we would use the hexadecimal digit 5 (1 + 4). Using just this hexadecimal notation, any orthogonal design can be created. Consider the Boxes program in Listing 1.

```
V 2,7
  H 5,1,2          []0 []D []0
  H 2,2,1,1,1,1
    V 3,1,3        []0 []B []0
    V 3,1,3        []B []0 []B
    V 2,1,1,1,2 []8 []F []4 []F []2
    V 2,5          []8 []E
    V 2,1,1,3      []8 []E []0 []8
    V 4,3          []E []0
```

Listing 1.

The output from this program is shown in Figure 2.

This same program produces a similar, but fatter figure when printed on a wider page. The relative nature of Boxes is demonstrated in Figure 3.

At this point it might be helpful to go through the construction of a box diagram step by step. Prior to the execution of any Boxes instructions, there is a single, undivided rectangular box. No subdivisions, borders, or text have been specified:

The first instruction will be a vertical subdivision, with a 1:1 ratio of the size of the resulting subboxes:

V 1,1

The shaded box designates the next focus of attention. Next, we horizontally segment the shaded box with the top box twice as large as the bottom:

H 2,1

No longer wanting to subdivide the shaded box, we specify the border for the box (this is the first atomic box). The hexadecimal digit D (1+8+4) will produce the border consisting of the top, bottom and left walls as follows: ||D

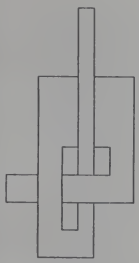
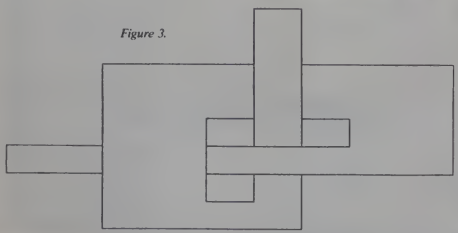


Figure 2.

Figure 3.



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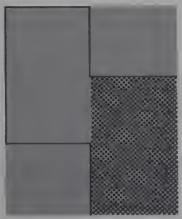
Boxes, continued...

Having completed the first atomic box, the focus of attention switches to the box immediately below. It may be further subdivided if so desired, but instead we choose to consider it an atomic box also, and draw the right wall only: []2

Continuing in a similar fashion, the diagram is completed when the final atomic box is outlined:

H 1.2



[]C

[]6

Combining these steps, the Boxes program.

```
V 1,1
  H 2,1
    []D
    []2
  H 1,2
    []C
    []6
```

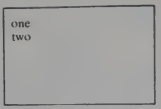
produces the following result:

The only thing left to describe is what can go inside the square brackets of an atomic box. Actually any sort of other language can be used here. For example: a graphics language describing pie charts and bar graphics might be used. For our purposes a simple word processing language was chosen.

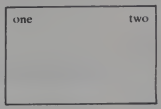
Text placed in the square brackets is printed in the atomic box as written, it is left justified and word wrapped until the box is filled. There are three special characters which influence the way the text is written within the box: ";" and "*" and ">."

The semicolon is used to indicate a required carriage return. For example one;two] will come out in two lines within a box.

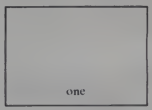
The asterisk, "*," is a special character which acts as padding of spaces. The asterisk will insert enough spaces to push



surrounding strings to the edge of the box. For example [one*two] will come out as one line in a box with "one" all the way to the left and "two" all the way to the right:



More than one asterisk can appear on any line. When this happens, an equal amount of space is allocated to each asterisk. In addition, when a line has only an asterisk and nothing more the padding will be vertical rather than horizontal. For example [*;*one*] will produce a box with "one" centered on the bottom:



The " >" is used for simple indentation with an atomic box. Any text following a " >" will word wrap back to the column in which the ">" appears. The ">" (as well as the semicolon and asterisk) will not be printed. For example:

[Step 1: > Sketch out a rough draft of ... your boxes on a piece of paper;;...

Step 2: > Identify all of the atomic boxes]

will print as:

Step 1: Sketch out a rough draft of your boxes on a piece of paper

Step 2: Identify all of the atomic boxes

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July 1981

M	T	W	T	F	S	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

Monday		6 2:30 Meeting with Mr. Smith, Auditor	13 3:30 APR demo on COOLS - See Steve for place 1) reminder - call Vincent for tour of his office	20 9:00 Strategic Planning Workshop at the Holiday Inn	27
Tuesday		7 8:30 Labor Relations class	14 10:45 Tech Council Meeting - asked to attend by Frank	21 9:00 Strategic Planning Workshop at the Holiday Inn	28
Wednesday	1 1) Vacation - White water rafting on the Klamath river	8	15	22	29
Thursday	2 1) Personal Choice Day - Rafting	9 9:00 Monthly IOS Staff Meeting 2:00 Meet with Rick Pflaum	16 1) STAR Demonstration	23	30 1) Start Planning Process
Friday	3 1) 4th of July Holiday - Rafting	10 9:00 Tech Session 2:00 Meeting with Svend 7:30 Dinner at Keith and Brett's	17	24	31
Saturday	4	11 7:00 Dinner	18	25	
Sunday	5	12	19	26	

Figure 4. Sample Calendar Produced Using Boxes

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CIRCLE 305 ON READER SERVICE CARD

Boxes, continued...

Notice the use of the ellipses, "...". They can be used to break up a long line of text in an atomic box description. The ellipsis and all following blanks will be ignored by the program. This is important since all other blanks in the text of an atomic box are otherwise accepted like any other character.

As mentioned at the beginning, the motivation for creating Boxes was to have an easy-to-use language to produce calendars. On page 112 is an example of such a calendar (Figure 4). You may be somewhat startled at the complexity of the Boxes program (Listing 2) in the following example. This program was written by the Calendar program using Boxes as an intermediate language for forms creation. □

```
h 1,7
  v 26,46,21
    [|0
  [*;*July, 1981*;*]0
  [* M  T  W  T  F  S  S*;...
   *     1  2  3  4  5*;...
   * 6  7  8  9 10 11 12*;...
   *13 14 15 16 17 18 19*;...
   *20 21 22 23 24 25 26*;...
   *27 28 29 30 31     *]0
v 5,8,8,8,8,8
  h 11,11,11,11,11,3,3
    [*;Monday;*]0
    [*;Tuesday;*]0
    [*;Wednesday;*]0
    [*;Thursday;*]0
    [*;Friday;*]0
    [*;Saturday;*]0
    [*;Sunday;*]0
  h 22,11,11,11,3,3
    [|0
    [*1;*;1) Vacation - White water rafting on the Klamath river]F
    [*2;*;1) Personal Choice Day - Rafting]F
    [*3;*;1) 4th of July Holiday - Rafting]F
    [*4.]F
    [*5;]F
  h 11,11,11,11,11,3,3
    [*6;2;>30 Meeting with Mr. Smith, Auditor[F
    [*7;8;>30 Labor Relations class[F
    [*8.]F
    [*9;9;>00 Monthly IOS Staff Meeting;2:>00 Meet with
    Rick Pflaum]F
    [*10;9:>00 Tech Session;2:>00 Meeting with Svend;...
          7:>30 Dinner at Keith and Brett's]F
    [*11;7:>00 Dinner at Stacy's]F
    [*12;]F
  h 11,11,11,11,11,3,3
    [*13;3:>30 APR demo on COOLS - See Steve for place;*;...
          1) reminder - call Vincent for tour of his office]F
    [*14;10:>45 Tech Council Meeting - asked to attend by Frank]F
    [*15;]F
    [*16;*;1) STAR Demonstration]F
    [*17;]F
    [*18;]F
    [*19;]F
  h 11,11,11,11,11,3,3
    [*20;9:>00 Strategic Planning Workshop at the Holiday Inn]F
    [*21;9:>00 Strategic Planning Workshop at the Holiday Inn[F
    [*22;]F
    [*23;]F
    [*24;]F
    [*25;]F
    [*26;]F
  h 11,11,11,11,11,6
    [*27;]F
    [*28;]F
    [*29;]F
    [*30;*;1) Start 1982 Planning Process]F
    [*31;]F
    [|0
```

Listing 2: A Program Written in Boxes to Produce a Calendar.

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★ ★ ★ b = book ★ ★ ★

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An eclectic interview with Art Luehrmann, writer, philosopher, and renaissance man of the computer age.

Pascal, Ada and Computer Literacy

David H. Ahl

In 1969, when I took over the Educational Products Group at Digital Equipment Corp. and first started to give serious thought to instructional uses of computers, Dr. Arthur Luehrmann at Dartmouth was one of the people to whom I turned. Art had developed a series of interactive graphics programs *for student use in physics at a time when most other people were still thinking punched cards and batch processing. Two years later when other people had graduated to Teletypes, Art had developed a graphics football game which depicted the playing field in perspective.*

In 1978, Art left Dartmouth to head up the computer program at Lawrence Hall of Science. In 1980, he and his wife Martha struck out on their own with a new venture, 'Computer Literacy."

Over the years, Art has written many provocative articles. Probably his most quoted piece is, "Should the Computer Teach the Student or Vice Versa?" done for the 1972 Spring Joint Computer Conference. It was reprinted in Creative Computing *and now appears in* The Best of Creative Computing-Volume 2.

I recently had a chance to talk with Art at his home in Berkeley. This is an edited transcript of the conversation which ranges from Pascal to Ada to future computers to artificial intelligence to computer literacy. Want a glimpse of the future? Read on.

D.A.: There is a growing interest in Pascal today. People are buying Pascal language cards, but perhaps some don't really understand the reason of another language. Why Pascal?

A.L.: That's a good question. Your remark about people having bought the language system and not knowing why is probably very accurate. My guess is that 40-50% of the people who bought the language system still don't know how to work Pascal because of the inadequate documentation that came out with the product the first time around.

However, my feeling about languages is not purist. I don't think there are good languages and bad languages; I don't think that's a good way to think about languages.

Computer languages came into being like natural languages. After all, they are human inventions. They have a culture that grows along with them of people who speak that language, do their writing in it and think in it. New languages come along and have a different kind of shape and thrust and there will be groups of people who think in that new language. Deep down, they are not all that different from one another. A linguist wouldn't waste ten minutes on a computer language. They have about 30, 40, 50, or 100 words at the most in their vocabulary and there are probably eight or nine sentences you can say that are legal. They are boring. A person who works around computers probably knows three or four languages. If he wants to learn a new one, it takes about a week. It's not like learning Russian. The differences between computer languages, I feel, are very much overrated.

Pascal and Basic are much more alike than they are different. LISP and Basic are certainly more different than Basic and Pascal. There's a place for all of them. I don't think it is right to say that some languages are good and some are bad; and that as soon as we get the perfect language everything will be wonderful. They each are great at some things and bad at other things.

The differences in computer languages, I feel, are very much overrated.

Basic is good, I think, not because of the language, but because of the way it is implemented. It is accessible. Anyone, within five minutes at most, can do something in Basic. One can write a program that generates output and maybe does some processing along the way. On the other hand, writing a Pascal program in the first five minutes is virtually impossible. It's not because Pascal is hard; the programs are equally easy or hard, but the implementation is such that when you are using Pascal you have to know you are entering the editor; you have to know that you have to leave the editor in a certain way to be sure that what you wrote gets saved;

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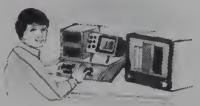

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you have know to type RUN to run the program and when you get your error messages, you must know to go back to the editor.

In most implementations of Basic you are always in the editor except when you are running. The editor understands words like RUN and LIST and understands the syntax of Basic. It is a kind of peculiar editing. It's not really an editor, but a kind of mixture. In a Basic environment many things go on under the cover of which you are not aware as a beginner programmer. You are able to write a few things, get some answers and write some more and make your changes quickly.

Basic is particularly easy to get into and Pascal is hard. It has nothing to do with the language. The languages are really structurally very similar.

If you can write a program that fits on the screen of your computer, there is absolutely no reason to do it in Pascal.

D.A.: Why would someone want to use Pascal?

A.L.: For a short, quick and dirty program, they shouldn't use Pascal. If they are trying to get an answer and they can do it, my rule of thumb is: if you can write a program that fits on the screen of your computer, there is absolutely no reason to do it in Pascal. It doesn't make any sense. If, on the other hand, your program is going to grow into four or five or ten screen fulls, probably Pascal is a good choice among languages because you can read what you wrote. You can follow the logic more clearly. If you come back a month later and try to make a little change in a Basic program that is 100-200 lines long, you have to read it really carefully, and watch all the GOTOs and all the line number references. You can't just pick out a block of 10 lines and say "Gee, I know how that works. I can make a change because I know with confidence how that section works." In a structured language like Pascal, you can indeed read a block without looking at the context at all. You can say, "I know exactly how these ten lines work, and if I make this change, in high confidence I know that it won't have side effects." That's the big thing. I think that's the bottom line.

D.A.: You've been comparing Pascal with Basic but isn't it more closely related to Algol?

A.L.: It derives from Algol. You can see all kinds of Algol-like ideas in Pascal. That's its closest relative. Basic is derived from Algol too. When Kemeny and Kurtz put Basic together they were very much influenced by Algol 60. More so than Fortran. Fortran had some real problems that Basic was supposed to resolve; the formatting of outputting is the most obvious one. The Basic FOR loop is more like the Algol FOR than it is like the Fortran FOR. In Fortran, the FOR loop gets executed once no matter what. (Or it did until recently.) The Basic FOR loop was devised so that it didn't do that. Unfortunately the people at Microsoft never seemed to get that point. They made their Basic FOR loop into somethng that is like the old buggy Fortran FOR loop, the one that makes you go through it whether or not you are supposed to.

D.A.: What do you think the future of languages is going to be? Will there be many new ones?

A.L.: There probably will. I also think that languages are getting more complex as people realize the variety of different things that computers can do. I think it will probably take a different kind of a language to handle parallel processing. What we are seeing right now is languages that are really designed to do one thing after another. That's been reasonable because the processor has been an expensive part, but today you can buy a 6502 for about $7 or $8. Imagine a computer that has 100 or even 1000 of those. What kind of language does it take to define a task that might be carried out by any of 100 processors at the same time; or at a time you may not even know about or specify. What kind of language does it take to do that? It's very different from languages that are basically sequential.

D.A.: Do you think it will be more like some of the things that Carnegie-Mellon is doing in which, if a processor is unable to do a job, it calls on another and another, etc.? Or more like Smalltalk?

A.L.: I don't know. Smalltalk assumes that there is only one processor, but conceptually there are a bunch of different actors. The language is closer to the kind of computer system that is likely to be around for the next ten years than the computer system that the Smalltalk researchers are designing. There probably will be a more appropriate language development than sequential languages. My own notion is that as multiple processors become possible and feasible economically that one will have to start to think of internal computer management systems similarly to corporate managment

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systems. You must allow a certain amount of autonomy and lack of information down below to get the job done. Then you look once in a while to see if the job got done and once in a while you fire a processor, because it's just not doing the job. That's a silly idea, but it's probably not that silly after all. If you tried to analyze what it would take to have truly centralized control of a computer system that had 1000 processors and just start counting the number of wires that would go from each processor to all the rest you realize that you couldn't build a computer like that. You are forced into autonomy, letting processors run by themselves, and checking up on them once in a while. You are also forced into the lack of being absolutely sure that the job ever gets done. What large company really knows if the job they are doing is really getting done? It drives the mathmetician crazy because he can't prove anything except in a statistical sense.

The complexity issue is a major one today. There are scores of problems that you just can't solve in any absolute sense because of the inherent complexity at hand. But on the other hand, you can get by pretty well with solutions about which you can establish proof. I think to make really smart computer systems, we are going to have to tolerate much more uncertainty in terms of proof than we have previously considered. That flies in the face of all tradition in the proof of a algorithm and proof of correctness that has given us such nice structured languages like Pascal.

D.A.: It flies in the face of all the computer scientists too, and the fundamental design of computers which aren't designed for the partial or imprecise solution.

A.L.: On the other hand, without computers we have had to get by with people and their decisions. We can't prove anything about how people arrive at decisions and by and large they have done pretty well. Our model of intelligence is the human being. Artificial intelligence is trying to make computers as good as people. It may be to get there the designs will have to relax a bit and permit error. That may be the only way to get to true intelligence. True intelligence sees things that aren't really there and that creates theories. Theory is always more than the fact. Any scientific theory claims things to be true that are far in excess of the number of experiments that have been carried out. Having that theory is already a leap of the imagination and if computers are going to be truly intelligent, we are going to have to permit them to go beyond that which is provable and let them do the kind of inductive thinking that people do. Seeing a pattern is inductive, the pattern isn't really there, it's an imposition on the data. It organizes it in a certain way.

D.A.: Do you think computers can see such patterns? You're saying, "Okay, we'll design computer programs that come up with unproved and uncertain results and therefore they will have the same inductive reasoning powers that humans do." That's quite a leap.

A.L.: Yes, and it's dangerous. We want to be able to pull the plug if we don't like what the computer comes up with. The inductive leap isn't all that different from seeing things that aren't there. It's true, nevertheless, that the way people make advances is by jumping way ahead of things that they can prove deductively. Suddenly seeing there's another way to organize the known facts. Saying, "Let's make that a law. Let's see how far we can go with

People should always worry about any systems that pretend to be more important than they are.

this new theory." Then it goes for a while until another theory is proposed. The theory is always bigger than the facts. That is quite the opposite of what we do with computers. We want computers to be rigorous logicians, deductive, deductive, deductive. We want to be able to prove everything from the first principles. Computers do things very differently from the way people do. A truly intelligent, automatic system is going to have to be allowed a lot more freedom.

D.A.: Do you think people will allow it enough freedom to make a decision that really counts, or will we think of computers as dolphins, something that we try to understand, or more likely, will we think

of them as slaves? After all, we've built them and they must do our bidding.

A.L.: It depends on the quality of the theories they – computers – come up with. If they are better than the ones people come up with, we might have a little more respect for the computer. That's still far down the road, and I can't imagine that actually coming into being for a long time. People should always worry about any systems (machine systems, government systems, etc.) that pretend to be more important than they are. You have to be ready to pull the plug on all of these and not trust them all the time because they may be wrong. When we permit computers to be wrong, we have to also be prepared to be very critical and pull the plug.

D.A.: Earlier today we were talking about the Ada language. I believe that this is a case where it may not be good to let the computer be wrong by choice; where being wrong because the program wasn't debugged or because the language itself wasn't totally correct is not at all desirable. Furthermore, DoD plans to use Ada to control all of our weapons systems, a herculean task. But no matter how huge the programming job, I also would rather not see a computer leaping to intuitive case of launching a missile, I would side with that point of view.

theories of how best to deploy these weapons.

A.L.: That's a very good example. If you launch a missile you want it to go and explode where it was programmed to go and not some other place. That's a supreme case that cries out for provability. In a case of launching a missle, I would side with that point of view.

On the other hand, much of what happens in life is not subject to those same laws of provability. We, in fact, live with systems that are not subject to that same criteria and we suffer for it. We have major wars every few decades and lots of people die because we don't have that same confidence and provability in the social systems we live with. On the other hand there are productive systems that plant food and harvest crops, etc.

D.A.: I would hardly say that those systems, mechanical or whatever, are responsible for wars.

A.L.: I agree. However, I maintain that the non-computer systems that we live with such as government, law, education and those many other complex systems work for the most part. With the number of people in the universe, it's hard to imagine how any centralized control system would work any better than these decentralized systems. Nevertheless, every so often they go crazy and awful things happen like war. It's that kind of tension that I see between systems that are semi-autonomous and once in a while go crazy and about which it is hard to establish

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proof versus systems that are top-down, totally logical, and terribly complex. The more tight the organization is the more complex the system is. It may just grind to a halt because we can never get all the information around all the actors in a coordinated way. I think complexity forces autonomy. The more complex things are the more it is necessary to divide the system up into autonomous units just to be able to cut the wires and let them run independently (sometimes in conflict). There has to be a way to resolve conflict as soon as you have autonomy.

D.A.: This sort of brings you full circle back to Pascal.

A.L.: Yes. Pascal is a kind of exercise in a purist notion of top-down—logical and with tremendous clarity. Yet you must wonder whether it can handle truly complex problems.

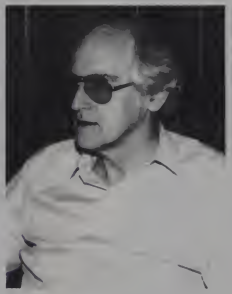
D.A.: Thinking of Ada again, I find it amazing that the Department of Defense would switch their gargantuan computer effort into an entirely new language.

Kids should have a good command of their native language and a command of one or more computer languages.

A.L.: Yes, but they did the same with Cobol. They defined it from the ground up. Classified it and suddenly it came into being. The thing is that people have very little experience with real-time programming environments. I think that is probably what worried Hoare.* People were attempting to specify a language without having had prior experience with it. To nail things down in a standards document that are not related to everyone's common experience is risky. The standards should come after you know what you are doing. You discover your errors and find standards are needed. But to use a standards document to invent a new thing is a chancey proposition.

D.A.: With your new venture in Computer Literacy, do you have some thoughts on what children should learn first? I don't necessarily mean a language. In the future, kids will be growing up and dealing with machines, computers, and technology in general. What should they do to learn to use it efficiently as well as to just cope?

A.L.: First of all, they should learn how to write and express their ideas in a form that a computer can carry out. That is the essential thing. Kids should have a good command of their native language, English or whatever, and a command of one or more computer languages. Which one or ones is not terribly important. To be able to express an idea in the form of an algorithm is the main ideal. It's a new idea and didn't really exist in the practical sense before the computer. To me the notion of computer literacy is a fairly simple one; it is modelled after literacy in your own language. It's the ability to be



able to express an idea and not just know some trivial words about computers. Computer literacy is the ability to read and write. Write for the computer and read what other people have written for the computer and criticize those ideas and prove them. In other words, to express a thought in the form of a computer program.

D.A.: When should kids start to get into this?

A.L.: As soon as they are ready. I think kids are clearly developmentally ready by the time they get into seventh or eighth grade. Some kids are ready before that. But surely by seventh or eighth grade kids can handle the levels of abstraction necessary to deal with a computer. To put that in perspective, the levels of abstraction are, when dealing with a computer, lower than the levels of abstraction needed to do algebra. If anything, computing ought to be a prerequisite to algebra. However, in many schools, algebra is a prerequisite to computing. I feel a kid develops the primitive ideas of algebra much better after working with a computer than the other way around.

D.A.: Do you think our *Computers for Kids* books (1st to 4th grade) are starting too early?

A.L.: No. I think it is a good idea for kids to know as much as possible as soon as possible. They're going to ask questions and want to know what computers are. They will see them everywhere. But I think that mastering a vocabulary about computers isn't terribly important. It's hearsay knowledge; it's not knowledge of the thing itself. Whenever I think about computers I think about learning how to ride a bicycle. It's different but there are some deep similarities in that a kid who is in the first grade can't ride a bicycle but he has bicycle knowledge because he sees other kids riding bicycles and he needs a vocabulary to describe that. "That is a

I think that English teachers would be much better teachers of computers than math teachers.

bicycle. See Johnny ride the bicycle. See Johnny fall off the bicycle." They know those words; that's important. But they can't ride the bicycle yet. They're not bicycle-literate. They have hearsay knowledge about bicycles. They become bicycle literate when they can get on the bicycle and ride around. That's what we want kids to do with computers. Get on the thing and ride it around. Make it do things for them.

D.A.: How do you see computers versus calculators?

A.L.: Totally different. Calculators are a math instrument for arithmetic. Computers do billions of other things. We make a big mistake if we use computers to teach math. Computers are really ways to express ideas. Computing is more like English or like a natural language than it is like math. I think English teachers would be much better teachers of computers than math teachers. They would ask the kids to rewrite; they'd say "Gee, Johnny that stinks. That computer may understand what you wrote, but I don't understand it. Rewrite it, make it clear." It's really not math. Math almost could be left out of computing. A good introduction course in computing probably wouldn't even

*Turing Award winner Prof. C.A.R. Hoare says, "For none of the evidence we have so far can inspire confidence that this language — Ada — has avoided any of the problems that have afflicted other complex language projects of the past."

deal with math problems until very late in the sequence.

D.A.: Should there be computers in the ideal classroom? Should kids have them available in their study periods or homes? When should kids use computers?

A.L.: I think there should be a computer course that should be part of schooling. At a certain time in a kids life, he would take computing. The same way he takes math, English, science, social studies, etc. He should certainly have an intensive exposure in a computing course. I see that as a preliminary experience to computer uses in a lot of other courses. Once the kids have that knowledge and once they know how to use the computer to solve problems, then the other courses in the curriculum should take advantage of this. Much as a history course takes advantage of a kid's ability to write. For the same reason a science teacher ought to give a programming problem to a kid to teach him to express an idea in science as another way to get that idea across. I see a structured use of computers in a computer course and a less formal use in other courses. The kids are going to have computers at home because they are cheap. The kids may be doing their homework at home on the computer for their classes at school.

D.A.: About school computers, some people have said, "Everybody should have their own." Other people have come out very strongly in favor of teams of two or three kids on a computer where they get problems to solve and can help each other solve them. What do you think?

A.L.: I've seen it work well both ways. The number sharing one machine can be limiting. You can get about three people at a machine; one at the keyboard, one on the left, one on the right. If there's a fourth, forget it. That person is out. Even with three, socially, there is usually an odd man out. Two seems to work reasonably well. I think that is an effective way of dealing with a limited amount of equipment. But when you get down to it, the kid who is moving ahead pretty well, moves ahead even faster, if it's one-on-one. But the kid who is not quite with it may drift behind. I think we need more experience in this area to be sure. Somewhere between one and two seems to be the right number, three is tolerable, and four is impossible.

D.A.: What are you going to do with *Computer Literacy* as a company or an organization?

A.L.: Specifically, we want to produce curriculum materials to teach computing as a regular school subject. That is our problem right now. The top item on our agenda is to create a course which introduces computing as a regular subject in the school—probably around the high-school or junior high-school level. The thing is that computers have come on the scene faster than the generations go and there are many older folks who are discovering they can do their jobs better if they know more about computers and their applications. We are also working with adults in their professional activities to teach them about computers and their aplications.

D.A.: Everyone at *Creative Computing* and I personally wish you the best! □

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Three Roads to Pascal

David Lubar

Like cleaning the leaves from the gutters, learning Pascal was something I kept planning to do and kept putting off. When the boss put three Pascal books on my desk, along with a request for a review, I knew the time had come. Two of the books were specifically for Apple Pascal while the third took a more general approach but leaned toward the Apple. The problem with covering three books is that while I could read the first as a rank beginner, there would be no way short of self-induced amnesia to view the next two in the same light. With this Heisenbergian dilemma in mind, I randomly selected *Apple Pascal—A Hands-On Approach* (Arthur Luehrmann and Herbert Packham, McGraw-Hill Book Company, New York, 430pp., $14.95) and began a journey through what some claim is the language of the future.

Getting Started

After a brief introduction, the authors guide the reader through the process of booting the language from disk. The book is aimed at users with a single drive, but contains an appendix covering any differences encountered in a dual-drive system. It soon became obvious that the authors are doing more than teaching a language; they are patiently showing the novice how to use the Apple Pascal *system*. It definitely is a hands-on approach. The reader is shown not only the correct procedures, but also various ways to crash the system. The authors suggest various steps to try, allowing the user to lose a file or hang the system. Once all is lost, they explain what happened and what steps are required to get back into the system. This better-now-than-later approach is good. Rather than just cautioning against something, they let you make the mistake. Pavlov would approve.

Within the first few chapters, the reader is entering programs into the system and learning to use the powerful editing features of Apple Pascal. The early programs are simple examples of how to put text on the screen. While later examples grow in complexity, none is so long as to discourage the slow typist. In many cases, the authors first present a short program and then give several modifications or additions that can be entered through the Pascal Editor. Each chapter ends with a summary of what was covered, followed by a short quiz, giving the reader a chance to make sure he hasn't been lost along the way.

Throughout the book, the authors make almost no mention of Basic, working on the assumption that Pascal is the reader's first language. This approach seems to work.

After introducing a few elementary Pascal commands, there is a chapter on generating music using routines from the Applestuff library. Applestuff contains procedures dealing with sound, paddles, and other Apple-specific features. More commands are introduced, appearing in logical order as they are needed to expand or improve the sample programs. Another highlight of the book is the illustrations, which show exactly what appears on the screen. In this way, the reader knows whether he has followed the example correctly.

After the music section, the book moves into one of the major features of Pascal—defining procedures. A procedure is a set of commands that can be called from other parts of the program (or even referenced recursively). While the concept is similar to Basic subroutines, there are differences. The next chapter introduces functions, which are the other main building blocks of Pascal programs. After that, the book goes strictly Apple again with a section on graphics.

At no time do the authors throw too much at the reader. Everything appears when it is needed, and everything is clearly explained. The above covers the first seven chapters. There are seven more, covering branching, string variables, while loops, data types and sets, arrays, records and files, and many other features of Pascal. The final chapter tackles the tough topic of recursion.

By choice, the authors did not cover the GOTO statement. In some circles, this statement is frowned upon. A few other portions of the language aren't touched, but nothing crucial is missing. I am impressed with the book, and feel it gives an excellent introduction to the Apple Pascal System. While it does not encompass every single aspect of the language, it contains eveything the beginner needs.

Next up was *Pascal Primer* (David Fox and Mitchell Waite, Howard W. Sams & Co., Inc., Indianapolis, IN, 206pp., $16.95). The book has much to offer in the way of eye appeal. It is sprinkled liberally with cartoons and all listings are highlighted in orange. The topic is mostly standard UCSD Pascal, with a few mentions of specific Apple features. Since standardization was the goal, nothing is said about the Apple Editor or Filer. Thus the book shouldn't be used as an Apple user's sole source of information. On the other hand, those who use this book will be able to write code that will run on any Pascal system. The authors mention that the book should be used in conjunction with the manuals accompanying any specific system. Throughout, they point out any non-standard features, warning the reader about commands that might defeat transportability.

The approach here is somewhat concentrated. In one chapter, for example, six variable types are covered. Each is explained, though some are not used until later chapters. This concentrated approach is good for reference or for a second source of learning, but a bit tough on the novice. It's a bit easier to learn one or two variable types at a time than to see them all at once. The book is rich in sample programs. Unfortunately, the sample program often appears on the page after the explanation, necessitating a lot of page turning during the learning process.

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CIRCLE 209 ON READER SERVICE CARD

Three Roads, continued...

Though the book begins with short programs, some of the later examples are rather long. The long programs, however, do present useful examples. One is a loan-payment program that, in its final version, takes up seven pages. Another, for tic-tac-toe, is twelve pages long. The merit to these programs is that they are developed step by step, giving the reader an insight into not just the langauge, but also the logic behind the language.

Several useful appendices are included. One explains techniques for interfacing assembly language to Pascal. Sample programs show how to simulate the PEEK and POKE functions available in Basic.

In general *Pascal Primer* contains a lot of information and an admirable aim toward transportable code. While it might not be the ideal book for those who own the Apple Pascal System, it is good for those who are interested in an overall view of the language.

Third in the line came *Pascal Programming for the Apple* (T.G. Lewis, Reston Publishing Co., Inc., Reston VA, 234pp., $12.95 in paperback). Here the feeling was overenthusiasm. The author seemed so excited about Pascal that he threw everything at the reader at once. He always seemed three steps ahead of the reader, making it easy to become lost. Even with the advantage of having just read two other Pascal books, I had a hard time keeping up with this one. The book also lost touch with the user at times. When statements requiring the left bracket were first mentioned, for example, no explanation of how to get the symbol from the Apple keyboard was included.

This is not to say that the book is without merit. It contains a great deal of information, including handy summaries of intrinsic functions, compact examples of the results of various Boolean expressions, and good reference information on the graphics commands. Those who are familiar with Pascal will find much of value here. But the beginner should not make this book his first stop on the road.

Of the three, *Apple Pascal—A Hands-On Approach* is the best buy for the Apple owner. It could even be used by someone without a Pascal system at hand. The only problem is that there are times when the authors suggest things for the reader to try without explaining what the result will be. This works well when the reader has a system available, but might be a bit frustrating for those who don't. Still, this is a minor disadvantage when compared with the high quality of the book, and the book shouldn't be faulted for this since it is designed for hands-on learning.

The real test was whether I had learned enough to do a program on my own. For a test, I tried that old classic, the bouncing ball. Keeping in mind the procedure-oriented nature of Pascal, I wrote routines to draw a box, to determine new coordinates, and to change delta-x and delta-y whenever the user pressed a paddle button. A small driver at the bottom did the work of calling the procedures, and a While loop kept the whole thing running until a key was pressed. The program was short and didn't take long to enter. My initial pleasure with the ease of the editor faded slightly as I had to recompile the program for every syntax error. I had been spoiled by Basic and assembly language. In Basic, you can just fix a syntax error and get on with things. With machine language, the assembler catches syntax problems. Here, I was jumping from editor to compiler, running through the whole thing again for every forgotten semicolon. Luckily, besides the syntax errors, the program worked well enough for me to feel I had at least a grasp of what Pascal was all about. The books, especially *Apple Pascal—A Hands-On Approach*, had gotten me on the road. □

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Mail Chauvinism:

The Magicians, the Snark and the Camel

Ted Nelson

It may not look it, but much of the action in computers has already ended. In the next decade they'll simply stamp out machines like those we know already though with new interconnections, at lower and lower prices and with, we hope, better and better software.

But the real action now is in Networks, Protocols, Standards, Encryption and Databases; and at least one war of shadows in Washington may determine our freedoms as users and citizens. And you may already have won! But eternal vigilance is the price of freedom, so read carefully.

I. The Snark

In Lewis Carroll's epic poem, "The Hunting of the Snark," a party of very dissimilar Victorian gentlemen all go off to catch something called a Snark. The *real* catch, however, is that though all think they are after the same thing, each has an utterly different preconception of what a "Snark" must be, an image conjured up from each man's background and preconceptions.

This allegory will be found suggestive in many branches of the computer field. At the Electronic Mail and Message Conference, its relevance was particularly striking.

The Electronic Mail and Message (hereafter M&M) Conference was held in Washington on December 11 and 12, 1980—the waning days of the Carter administration. Sponsored by numerous federal agencies and committees of Congress, and by AFIPS, the computer society of all computer societies, it took place in a huge oak-panelled room in the Sam Rayburn Office Building. The room was called, by a sign on the door, "Committee on Interstate and Foreign Commerce."

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CIRCLE 135 ON READER SERVICE CARD

Mail Chauvinism, continued...

The conference began in an atmosphere of excitement and wound down from there. When it began, at 8:00 a.m. Thursday, the room was tense and crowded, packed with hundreds of people, and the rows of officials' chairs that stared down at us were mostly full. But the next morning only half as many came, and only a few were left at the close.

But the beginning started in a crackling atmosphere. Middle-aged executives looked quizzical, elegantly-dressed young lawyers grinned smugly, nervous reporters looked cowed. ("What do Electronic Mail and Message Systems have to do with *news*?" pleaded their eyes.) Almost everybody was well-dressed and had short hair. Many or most of the technical speakers were bearded, but few of the audience.

There were some exhibits downstairs of on-line systems (unfortunately not including Arpanent, which was often mentioned). Tasteless lunches were served by listless waiters, though a marvelous open-bar buffet miraculously appeared after the first day.

Mainly the conference was a rapid-fire succession of speakers, tightly paced from 8:00 a.m. to 5:00 p.m. for two days—a note-taker's nightmare. In the ensuing months I believe I have been able to figure out the major themes and issues, even though the speakers were randomly sequenced and spoke in different tongues.

Rather than tell about the speakers in the order they spoke, requiring you to untangle many separate threads, I will describe as coherent sequences various stories that actually came through to us piecemeal and in random order. In this article I will try to present the new things I learned and the principal issues, as expressed by some of the strong personalities present.

Several different schools of "electronic mail" were present at the M&M Conference, though not all were spoken for from the platform.

Two main views were heard, though there are several more. One was the idea that electronic mail is in some sense a simple replacement of paper mail, which the Post Office speakers seemed to think. The other view sees "electronic mail" as just one facet of the coming new world of transmissive computing in which a lucky few already live.

The speakers can be divided into several groups. Outstanding were the three I call "the magicians," whose presentations of a computer tomorrow went far beyond electronic messages, though electronic messages formed an integral part of their presentations. Another group, the "packeteers," explained the various conceptual levels of packet communications and packet networks—the highways, and rules of the road, for this tomorrow. Another group spoke of dividing the electronic spectrum and when you should buy satellites; regretfully I must omit discussing them.

Then came representatives and spokesmen for the U.S. Postal Service, essentially explaining why they felt a need and a right to control electronic mail as they saw it.

And, finally, numerous "regulators"—government lawyers and administrators—told us about regulating the spectrum (which I must skip) and regulating private services and the post office (which must be covered).

Almost everybody was well-dressed and had short hair.

A surprising political issue surfaced at the conference: the role demanded by the U.S. Postal Service in a new world they claim to understand but may not. What the Postal Service wants to do might narrow and restrict what you can do in the future with your computer. At present there is a compromise, but these political issues may resurface at any time.

The lines appear to be tightly drawn. On the second afternoon a lady in the audience told me she was the only remaining attendee from the Postal Service—the other three had left.

Representative Rose

In a way the first luncheon speaker and his enthusiasms perfectly embodied the ideas and controversy of the conference. This was Representative Charles Rose (D., N.C.), who wore a striking plaid jacket. He heads the Policy Group on Information and Computers of the Committee on House Administration of the House of Representatives, and is chairman of the House Agriculture Subcommittee on Dairy and Poultry.

A computer enthusiast, Rep. Rose was introduced as having a "split screen bulletin board." Congress, he told us, has budgeted an "informational terminal" for every member of Congress. The two approved brands are Hazeltine and TI. A portable is given out only if the member signs a paper "agreeing to be trained in its use." Freshmen congresspersons have found this very appealing. Rep. Rose told us that at the next Congressional seating, the House would get a full view of electronic mail—now that "Old Stonehead," whose name I did not catch, was retiring from some post or other.

Many letters pass between congressmen, he told us, particularly "Dear Colleague" letters about their individual concerns, that go out to all fellow members. A representative reads the ones from certain people but not from others, he explained, and he would like to be able to automate this—including the screening out of the unwanted material. He is also interested in forms of teleconferencing for members: he would like to "create an electronic place where we can meet as friends in private."

But he was concerned for the use of these new media back in the districts. "I want Granny, at home, with her video text to be able to use this too...." And he would like to see public-access write-your-congressman terminals.

Unexpectedly, Rep. Rose spoke on what would be the political issue of the conference. "The U.S. Congressman has many friends," he intoned, "and one of these in the U.S. Postal Service." And so, he explained simply, he wants Electronic Mail to be beneficial to the Post Office. We will return to this point later.

The Wizards

During the opening remarks, Bob Taylor sat and listened like a college president: his gaze one of Olympian calm and warmth; musing, sympathetic but impassive. He looks still in his thirties, but can't be, since he was head of Arpa/Ipt over a decade ago.

Taylor is manager of the Computer Science Laboratory at Xerox PARC. The people there do the most powerful and exciting things in the whole computer

CONTINUED ON PG. 134

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CIRCLE 177 ON READER SERVICE CARD

Regulation: Not What You'd Expect

The Regulators

The Postal Service representatives showed us, in the flesh, a government bureaucracy in its struggle for power. You don't often meet bureaucracy as *them*, in person. But surprises also came from other government bureaucrats at the M&M Conference.

You've heard about too much regulation out of Washington? Well, so have they, these bureaucrats who spoke at the M&M Conference, and it is astonishing to see and hear half-a-dozen administrators and regulators presenting different aspects of how they hope to *avoid* regulating private industry, in the electronic network business, but how they *hope* to regulate the Post Office, to keep it from getting out of hand.

The Post Office wants to take over point-to-point electronic mail, or at the very least compete with private enterprise message services, which are already offering total point-to-point packet services and more. And new "value-added" services, such as data banks, storage and retrieval services, are competing with the very packet networks that carry their services.

So we have a complex picture, one obviously ripe for government regulation. But who will be regulated, why, and in what way?

While the impact of the new Reagan administration may be hard to assess, it would seem to favor private enterprise and less incursion by the Post Office. However, it might also favor less regulation, and it is regulation that holds the Postal Service in check.

It's a complex picture, and nobody really knows what's going to happen, but in the following I'll cover what came up during the Mail and Message conference.

What Holds the Post Office in Check?

The Postal Service is held in check by the Postal Rate Commission, which oversees it. And the PRC, in turn, has a consumer interest office which noticed the problems with the original ECOM proposal.

The FCC, too, has oversight over the Postal Service, simply because it has control over interstate electronic carrier services and radio licensing. ("They're going to have to get their licenses somewhere," observed an FCC commissioner archly.)

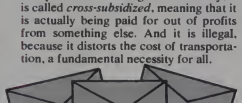
Congress, of course, has the power to pass laws that reduce or expand the Postal Service role. (But once laws are passed, of course, it is generally up to executive agencies to interpret them, including those watchdogs already mentioned.)

Theory of Common Carriers

Both private services and the Post Office, if they offer point-to-point electronic communication, fall under the heading of "common carriers," and thus fall subject to the Federal Communications Commission. Thus, some common-carrier theory is in order.

A common carrier is somebody who offers to provide some kind of transportation to anyone. (You are probably wondering when the term "common carrier" originated in written law. 1930? No. 1890? No. 1348? Yes.) Modern regulation of common carriers began in the nineteenth century, under the Interstate Commerce Commission, principally because the railroads were being blatantly unfair in their rate structure.

The common carrier must provide service to all customers who request it, with no undue discrimination in pricing or other conditions of service. In order to recognize improper pricing, however, regulators must investigate the relation between the cost of providing a service, and the price of that service based on that cost. (Otherwise a carrier could gouge on one service and provide another at a low cost. Note that in ordinary business this is called a "loss leader," and perfectly acceptable, but in a regulated industry, it is called *cross-subsidized*, meaning that it is actually being paid for out of profits from something else. And it is illegal, because it distorts the cost of transportation, a fundamental necessity for all.



Thus, published "tariffs," or tables of rates, state the precise conditions of service, and the carrier must keep up these services for these rates indefinitely until he is given permission not to do so. (Note that with published tariffs, not only is what you see what you get, but what you see is pretty much *all* you get, since any enhancements or additional service would fall outside the permitted tariffs.)

A gloomy business, this, utterly insulating suppliers from the market forces which make our economy otherwise so dynamic. But generally regarded as very necessary.

In this century, especially through the Communications Act of 1934, common carrier doctrine has given the Federal Communications Commission regulatory power over such services as telephone, telegraph and radio station, much as other agencies oversee railroads and freight haulers.

The foregoing theory of common carriers was presented at the conference in a fascinating talk given by Philip Verveer, a lawyer at the FCC. Verveer, silverhaired, seems generally depressed and talks rapidly in a low voice, but with such directness and cogency as to get very full attention. There had been no applause at the conference till after his speech.

In his summary, Verveer expressed his personal opinions of the upcoming problems. What then must the FCC be concerned with in the new services? Three things.

1. *Possible cross-subsidy.* If a common carrier, such as the telephone company, or even the Post Office, proposes a new electronic service, they must prove the service can stand on its feet without being subsidized out of other profits.

2. *"Pipeline infrastructure."* The new basic transportation services, such as Telenet, must be regulated in the standard fashion.

3. *Enhanced services.* The question is whether enhancements to that pipeline service—new features, new software on top, connections to other programs and Licklider's showers of sparks—need to be regulated. The FCC, answers Verveer, proposes a double standard for these new services, depending on whether they're offered by old companies or new. He proposes only light regulatory oversight over enhanced services by *recognized* common carriers (read: Ma Bell, P.O.), in particular to make sure there is no cross-subsidization.

But the question, then, is will the *new* enhancers be common carriers?

Verveer saw this as "metaphysics." If a common carrier is an "entity found in nature," then you ought to know it when you see it, but if the notion is an arbitrary one to be applied by the FCC, then the FCC in its wisdom can leave most of them alone.

And that is his position: A common carrier in electronic hyperspace is whatever we say it is, and we don't intend to see any, regulating neither resale nor enhancement.

Verveer stressed that these were only his opinions. Nevertheless the arguments gained stature from both his keen presentation and his position as Chief of the Common Carrier Bureau of the FCC.

Is It Under The Tent?

Henry Geller, of the National Telecommunications and Information Authority, Department of Commerce, somehow reminded me of Henry Morgan. I think it was a two-level mischievous smile and a gallus-snapping manner.

Our policy, said Geller, is "to promote competition whenever possible," so as to foster a true market place and so businesses don't have to keep asking federal agencies what is legal. The issue, however, is what

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CIRCLE 251 ON READER SERVICE CARD

Regulation, continued...

should the Postal Service do in Electronic Mail.

The current "uneasy truce"—ECOM—has the Post Office doing only paper output and end delivery, not electronic output; but Geller considers that "inefficient." The possibility remains that this compromise will fall apart: "The Camel's nose is under the tent," says Geller. Geller further predicts that Congress will let the matter slide, and the problem will end up in the courts.

Geller's argument is an administrative one. If the Post Office makes an end-to-end system, it's a "hybrid" situation where government is competing with private industry. It is neither free enterprise nor the governmental "Postal Telephone and Telegraph" system of Europe.

But if that happens, end-to-end service head-to-head with private carriers, how can you have simplification and deregulation? If the government is operating a business, how can the real businesses get a fair shake? Industry and government agencies have different motivations and "different ways of borrowing money."

His position is that the Post Office ought to do physical delivery when people want it, and be hooked up for input from all nets, and that's it. But mainly for the sake of an uncomplicated regulatory picture.

Geller was joined in his presentation by Richard Neustadt from the White House, a smoothie young lawyer type in a striped suit.

On the camel issue, Neustadt was an optimist. The Post Office will *never* get into end-to-end transmission; the "camel's nose" model is wrong; the industry will never allow it.

Interestingly, none of the regulators approached the problem of the Post Office from the point of view of the dangers of oversimplification and inflexibility. The Post Office's greatest threat may be in reducing the imagination and power of evolving services. (See "Humph.") □

Mail Chauvinism, continued...

community, and he is their shepherd. It is rather like a shepherd fondly inspecting a bleating flock that he addresses us.

Taylor takes a poll of the group. Half the audience had used "electronic nets" (whatever they think they mean by that); but only a third had written a program. (This suggests that half scarcely knew what a computer was.)

Onward nevertheless. Taylor explains that one of the special features of electronic messages is that they are read at the *receiver's convenience*, waiting somewhere till he is ready. And that since they are really brought to us by and through computers, message systems are "software-intensive," requiring programming development on a grand scale.

He rolls the videotape. On screen we see Taylor at his Alto, the famous PARC hot minicomputer with the finely detailed screen. We see the screen divided into many fields, which part like the Red Sea as Taylor on the screen points first at one thing, then another. A prompt tells him that messages are waiting; he reads them, replies, acts, discards, causing various rearrangements of the screen with offhand magical passes of his hand.

"If you think about these as systems for moving strings of characters, you miss the point of their power."

One note we see him read on the screen causes him to change a schedule; another he tells, effectively, "Go file yourself." One note he sends electronically to several other people, selecting them by flicking their names from a list that appears.

Taylor explains as he goes. "My message system is much more than a message system," he understates.

Fields of text rearrange themselves on the screen, compress, expand. Sometimes the moving cursor is a box, sometimes an hourglass, sometimes something else. So quickly and effortlessly do the messages come and go on Taylor's Alto screen, you hardly realize that the work you see him doing would be a storm of activity if he were shuffling actual paper.

(The audience is studious but impassive. I get the feeling that only a few understand what they see—those who already know about it—but that the rest of the audience doesn't know what it's about and can't tell.)

These messages we see the videotaped Taylor working with are not mere telegrams that go from one person to another and stop. Rather, he may search and scan through them, alter them, pass them on, or reply, with a flick of the wrist; they roll and fly before his face like the cards of a riverboat gambler. Some of them involve graphics and color and audio. "If you think about these as systems for moving strings of characters, you miss the point of their power," he says.

The phrase "Office of the Future" has been bruited about a great deal in Xerox publicity, as in, "we're developing the Office of the Future at Xerox PARC," but of course who can agree on what that means? Yet here it is in front of us: the paper trivia-flows of the office are calmly controlled on the Flatland of the screen. I

don't know what the paperwallopers at Xerox Corporate think the Office of the Future may be, but I'll gladly settle for this one.*

What we see Taylor working with is still, in fact, a world of documents, separate, potentially printable on paper. But here is the kicker. Less than 1% of the electronic messages at PARC, he tells us, ever get printed out.

Wizard Two is Michael Dertouzous of MIT. He heads what used to be called Project MAC, where time-sharing began; now it has 300 employees and a more boring name, the Laboratory for Computer Science. He is tall, dashing, accented, ought to wear a cape.

As computer prices go down 30% a year, he says, hidden computers will proliferate everywhere, just like the "hidden motors" that we know as hair dryers and such.

He shows us screen-views of his own personal files: a schedule (which becomes a history file as it slides through the present), his list of associates and acquaintances (cross-filed by name and city, so he can fill his travels with companionship); his checkbook (which automatically categorizes everything).

And he shows us how message systems of the future might let us go shopping. Suppose he wants a certain kind of wallet. His computer now makes inquiries at various shopping data banks, looking for wallets of the right size and color, and makes notes on which ones come closest to the desired configuration.

Wizard Three gives us a conceptual framework for thinking about this world. He is J.C.R. Licklider, called Lick by everybody. Warm and cheery, Lick is a founder of time-sharing, past director of Project MAC, and Arpa pioneer. (Starting up the computer work at Arpa, he financed Ivan Sutherland's Sketchpad.) One of the greats.

Licklider foresees a world where "all intellectual functions are well supported by computers." (Right now we have "access to gigabits through punybaud," but that will change.)

Licklider's messages and examples on the screen involve fill-ins and subroutines and modelling. He shows how he can program his computer to make dinner arrangements when he goes to a certain city: if the first person invited can't have dinner, his computer scans the list of his other friends in the same city and issues dinner invitations to *them*. All this in a simple conditional language.

> ***"I want Granny, at home, with her video text, to be able to use this too...."***

But rather than talk about "computers," whose actual whereabouts and boundaries become indeterminate in this sort of a coming world, Lick prefers to talk about "agents" or "assistants," things you set up to do things for you. (Lick also likes to call them Olivers, after Oliver Selfridge, who came up with the idea around 1966.) Agents will handle "augmented telephone calls," stacking the calls and pushing them through automatically. Agents will pay your bill, checking them against the appropriate invoices in standard electronic forms. They will sniff out information a friend may have set out: his birthday, gift preferences and sizes, party invitations, information he would like from whoever knows it.

Agents will not merely receive messages; they will react to them, sending out new feelers and requests to other computers and agents. Messages, forking and thrusting through a forest of computers and agents, will inquire, update and reply, often waiting for interactive responses. Messages will independently link to animated diagrams and status displays, keeping them current.

* Note: this system effectively became available at the 1981 National Computer Conference, where Xerox demonstrated the Star personal computer. Stars are individual $20,000 machines to be connected together throughout a company by the Ethernet cable.

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CIRCLE 159 ON READER SERVICE CARD

Mail Chauvinism, continued...

Subprograms call each other *internally* all the time, says Lick; soon they'll be doing it *externally*, sometimes in parallel, sometimes queuing. So the interchange of "messages" becomes something larger, a cross fire of interacting events.

But now you see this messaging is something else. It is not postcards or telegrams, it is not document handling. In its back-and-forthing it is more like the telephone than telegraph. It is a new form of closely coupled responsive session, a chain-reaction system of intercommunications, among—what? Agents. Places. Data bases. Programs, texts, indications, semaphores. It is a pool-table model, like a gunbattle, like atomic nuclei near critical mass: the event-shower-interchange session. A shower of sparks.

CONTINUED ON PG. 140

Agents will pay your bills, checking them against the appropriate invoices in standard electronic forms.

The World of Packets, Protocol-and-Dagger

Packet nets range from Ethernet—a packet system for going between computers and terminals in an individual office—on up to Telenet, a world-wide packet service to which you can subscribe that will hook you to most other nets and time-sharing systems.

The basic idea of packet service is to get information—text, pictures, even voice—to and from the places you want. And it has to move in the timely manner that today's computer user expects—within fractions of a second. This is particularly true for highly interactive sessions involving two or more computers or agents in united interaction.

The internal mechanisms of packet communication are not hard to understand if you already understand about computers and disks. Essentially a packet network is a set of interconnected computers and disk drives, which finally connect to users of one sort or another.

All messages, however long or short, are divided into "packets," sequences of bytes of a uniform size (such as 128 bytes) and padded out to fill the last packet.

In a full-scale packet network, the actual data is sandwiched between the many additional bytes required to carry it along. The packet of data is surrounded by an "envelope" of bytes specifying parity checks, packet numbers (for the identification, retransmission and reassembly of damaged ones), addressee routing information, billing information. The envelopes may be changed by various computers along the way; only the contents are meant for the recipient.

A packet is not unlike a disk block. Though a disk block may be surrounded by various bits (parity, clock, guard), in the final analysis these are not the contents, but only helper information that goes away when the contents arrive successfully.

Packet transmissions go from one computer to another—sometimes through a long chain of computers—before reaching the final user. The first computer gets its packets ready—either dividing up and padding out the original message, or straightening out the packets it has received from elsewhere.

These it then sends sequentially over some channel to the next computer. The next computer signals to the sending computer when to send and when to pause.

Pause requests occur when the buffer area of the receiving computer is full, or part of the transmission has been damaged. If the buffer area is full, the receiving computer may in turn re-transmit the packets down the line, or put them in longer-term storage (such as disk). Such buffering may occur, for instance, if there has been faulty transmission, while the computer awaits the broken packets again.

Because so many operations can be performed quickly by the packet computers, they are able to make numerous and repeated checks on the integrity of the data, and effectively create a flawless transmission chain depite unreliable channels. And the transmission lines can be used very efficiently, even with all the extra bytes, because the packets may be densely packed over time.

(Commercial packet nets may also vary their transmission capacity dynamically, renting additional lines at higher cost during moments of peak demand. Thus, successive packets in a given message may arrive over different channels and different routes, arriving at intermediate points quite out of order. It's the integrity of the material at its final destination that counts.)

Protocols

The back-and-forth interchange associated with data communication is called a "protocol." We saw this above with respect to packet transmission: the receiving unit says when it's ready, and tells the sending unit when to stop. But that's just the beginning.

The packet protocols are not seen by the user; they are "transparent." But other levels of protocol may be part of the interchange that the user (or his program) actually sees. The construction and combining of protocols is one of the frontier problems of today.

There are simple protocols and complex ones, such as the protocol needed to drive a Calcomp pen-plotter. The computer must repeatedly wait for signals saying the plotting unit is ready, and send out the next commands only at such times. This is an "application" protocol.

Or consider the protocol of the automatic bank-teller machines.

The automatic teller has four basic functions: account status, deposit, withdrawal, and guarantee-a-check-at-the-supermarket. All but deposit require "authentication," making sure that the card in the slot and the password permit what has been requested.

The teller box sends a transaction ID, password, command and parameters. The bank's computer replies with the transaction number again, followed by either GO or NO GO (or the strong form of NO GO, GRAB, which causes the card to be eaten).

In today's complex packet networks, protocols are stacked and nested, relating to a hierarchy of computers, programs and agents along the way, with different messages addressed to "subnets," "gateway processors" "host processors" and the "user application" itself. The logic is along the lines of "Give this first note to the bartender and he'll let you in the back. Then give this note to the guy in back and he'll fix you up."

Several of the researchers at the M&M Conference—John McQuillan of BBN, Ian Cunningham of Bell Northern, Carl Sunshine of USC Information Sciences Institute, Vinton Cerf of Darpa—are working on systems of higher-level protocols that can be customized for variety of purposes at the user level while providing reliable transport and confirmation at the packet and other levels. Higher-level protocols are like higher-level languages: they seem to be inefficient at first blush, but the supposed inefficiencies are far outweighed by their improved maintainability and evolutionary potential. They can evolve and be upgraded indefinitely.

Ian Cunningham's OSI protocol, for example, is intended to work on a variety of networks and a variety of computers, providing a framework of standard protocols within and upon which can be built a variety of applications. There are seven layers (that we needn't get into here), but they go up to "session" layers, communicating between processes, and "presentation," dealing with data representation. Only a couple of these are within user reach.

Security: Privacy, Encryption, Authentication

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CIRCLE 259 ON READER SERVICE CARD

Dagger, continued...

will. Unfortunately, there will also be a need for privacy—for personal reasons, business reasons, and reasons of state—and to protect us *from* the state. And we need to think about these matters now.

The first and most obvious problem of privacy is encryption—keeping other people (and their computers) from reading your messages. This is not easy, and strange political problems are surfacing.

The "official" encryption standard—a code system generally available—is the DES. You can get a chip that performs this encoding and decoding, using a secret key you've chosen. But public accusations have been levelled at this method, specifically that the U.S. government may be promoting it because they know how to break it.

The much more powerful, tough-nut encryption system is the remarkable RSA code out of MIT, a "trapdoor" code with two keys. Either may decode what has been encoded by the other—but you *cannot derive one from the other*, at least in less than a million years of computation. This means *you can safely make one of them public*, so that anybody can send you a secret message (encoding it with your public key; only you can decode it) or you can "authenticate" a message, encoding it with your private key so that anyone can decode it only by using your public key, thus proving its origin. Though the government has apparently been trying to suppress the RSA code, so far it is a uniquely powerful solution to the encryption problem. Though a thousand times slower than the DES, it, too, may soon be available on a chip.

Unfortunately secret contents and authentication aren't the whole ballgame. Disguising whom a message is *to*, and how long it is, may also be important; yet these must be incorporated in the enveloping techniques of the packet system itself—a level of service which hasn't been offered yet.

Certain other desirable features also should be built in at the network level. These include "time-stamping" of transmitted material, and ways of proving a thing was sent—effectively, "registered mail."

Because of the ferment, complication and newness of all these areas, the packet-and-protocol men at the M&M Conference appeared to be unanimously against standardization at the present time. And would-be suppliers of service, such as the Post Office, must demonstrate that they give a hang about such matters.

1984sville

As already mentioned, several commentators have expressed alarm at the government's curious treatment of the DES and RSA codes. But other sinister forebodings can be found if you look.

Dertouzos of MIT warned us that networking can become a new totalitarian instrument, with surreptitious and unauthorized "explorations" an important new area of government imposition. Neustadt of the White House put it more simply: "Can the FBI intercept your messages?" And if someone snoops in the records of a message-repeating station where your messages may have been kept on tape, is it wiretapping?

Vezza of MIT also feels very strongly about this. In the testimony that led to the new ECOM design, he fought the Post Office's plan of keeping tapes for message verification: there was no reason, he thought, that the sender's original record would not be sufficient in case of doubt. But that has been overruled, and tapes of the billions of ECOM messages *will* be kept by the Post Office—for, we are told, a limited period of time. This is not unlike having the Post Office Xerox every letter that goes through the mail.

Those who believe conspiratorial tales of government intelligence agencies, covering the deaths of John Kennedy through John Lennon, see these matters as additional indication that our Secret Masters are preparing our further future enslavement. A more moderate perspective, however, would indicate simply that many people and agencies are behaving with authority in areas where not much is known yet. Perhaps the time is ripe for neither alarm nor smugness. □

Mail Chauvinism, continued...

The Camel

Across this landscape of cheery electronic possibilities there came, not so very long ago, an interesting intruder: the United States Postal Service.

You have heard of camels. You have undoubtedly also heard the expression, "When the camel gets its nose inside the tent, the rest will follow," or some exotic equivalent, intended to convey the idea that the rest of a camel cannot be far behind its intruding tip, and all of the camel will soon be within any environment it penetrates.

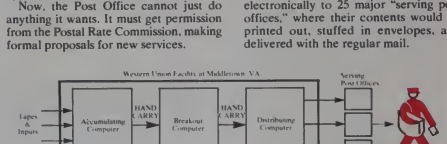
Now before this parable can be fully explained, and we can get back to the conference, it is necessary to fill in some facts and history.

By law, the Post Office has monopoly power over delivered things. You cannot, for instance, open a delivery service between cities except under certain between cities except under certain specific, narrow conditions. (And symbolically, you must have U.S. stamps on the parcels your service brings.)

This is the infamous "delivery monopoly." At least one M&M speaker, Lloyd Johnson, spoke as though there were a danger that the post office might *attempt to extend this monopoly to all electronic messages*. This also seemed to be the position presented by Jaquish of the Postal Service, who spoke as if the Postal Service had a natural right that extended into this new realm.

In 1978 the Post Office proposed to open a new service, called E-COM (Electronic Computer Originated Mail; the hyphen is something of a mystery).

Now, the Post Office cannot just do anything it wants. It must get permission from the Postal Rate Commission, making formal proposals for new services.



Original E-Com Proposal.

The Post Office proposed in 1978 to connect very large mail-senders—those sending thousands of pieces a year—to a centralized computer system. (This would be Western Union's facility in Middletown, VA.)

In this original proposal, a large variety of inputs would bring messages to the Western Union computer. Bills and form letters would be repetitively copied, electronically, with appropriate names, amounts and other fill-ins; then these finished telegraphic communiques would be sent electronically to 25 major "serving post offices," where their contents would be printed out, stuffed in envelopes, and delivered with the regular mail.

This proposal had several problems. One was technical ghastliness: tapes being

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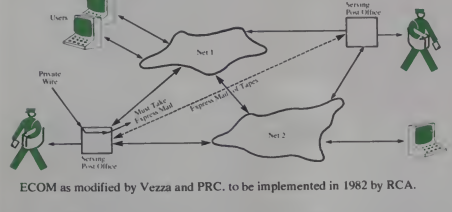
CIRCLE 233 ON READER SERVICE CARD

carried among separate computers, for instance. Another was high cost (30 to 60¢ a letter). Then came some deeper problems: in selling electronic transmission services, the Post Office would be competing with several common carriers. This further threatened a monopoly fight related to the Post Office's monopoly prerogative of delivery, threatening (at worst) that whatever electronic mail *might* become would only be what the Post Office *allowed* it to become. And finally and darkly, archival copies of tapes were to be kept.



ECOM as modified by Vezza and PRC, to be implemented in 1982 by RCA.

This proposal was brought before Albert Vezza, MIT professor and one of the architects of the Arpanet. He proposed a rather straightforward alternative: no centralized facility, and the use of common carriers—available electronic nets—between the serving post offices, where the printing and stuffing and delivery would occur.

The Post Office proposed in 1978 to connect very large mail-senders—those sending thousands of pieces a year—to a centralized computer system.

This was simpler. It did not compete with common carriers, but used them. And it cost about ten times less per piece.

The two alternatives—the original one and Vezza's—were brought before the Postal Rate Commision, which decides these things. There was a bitter fight. The PRC's decision: "implement the Vezza alternative." The Post Office fought this decision in the courts, but had to give in. Finally it was accepted by the Post Office board of governors, but they then turned around and filed a lawsuit against the Postal Rate Commission to make the new arrangement *permanent* before it had even been tried—that very arrangement they had just been fighting.

The new system will supposedly be implemented in 1982. (As of this writing, the Post Office has accepted a proposal from RCA, but its contents have not yet become available.)

One leading and mischievous feature was added to the Vezza alternative in the ECOM system that was finally approved. This was an input link direct to the serving post offices. However, since the Postal Service was explicitly forbidden to provide end-to-end service ("generation three"), information received in this fashion is to be *put on magnetic tape and sent by express mail to receiving post offices*. (It is as though this step were undertaken explicitly to be inefficient, and cry out for the electronic completion that is not now allowed. A cynic might say the feature was put there as a festering inconvenience, crying out for proper electronic consummation and thus challenging the present compromise.)

This was essentially the view of Henry Geller (see "The Regulators")—that the Post Office will be continually maneuvering to add electronic services until it has "the whole thing," a monopoly of delivery to your own terminal. With ECOM, "*The camel's nose is under the tent*," says Geller.

What is anticipated in these early stages, since only high-volume mailers may play the game, are corporate mass mailings such as dunning letters, product recalls, bills and special advertising. A special advantage of ECOM is its ability to put special Text Insert Messages (TIMs) into COmmon Text (COT), adding all the John Smiths to supposedly personal messages. It seems this would save considerable in-house effort along the same lines for major mailers.

The Conference Again

Now here we are at the conference again, and we will hear some spokesmen from the Post Office.

First comes the head of R&D for the Post Office, Paul Jaquish. He is slow-spoken, balding, somewhat angry-seeming; his title is Senior Assistant Postmaster General, Research and Technology Group of the U.S. Postal Service.

He comes on as the heavy with a belligerent and defiant manner. Here is what I got down:

"We *must control service*."

"We cannot allow our resources to be spirited away." And finally:

"We have a legislative mandate and a financial requirement."

Well, at least it's up front. But what did it mean? Was he talking only about delivery on foot? Or is he telling us *their* electronics must eventually be the only ones that make messages available to our personal computers? It certainly sounded to *me* as though Jaquish said, essentially: "Whatever this is, it belongs to us."

When it came time for questions, I tried to ask the question that was burning on my mind, but it took too long. I said something like: "The format of this conference suggests a premature delineation of 'mail and message' systems, arbitrarily cutting them away from teleconferencing, data bases, highly interactive environments, electronic publishing and archiving. Could you comment?"

Jaquish's one-syllable answer got a big laugh, and we broke for the first lunch.

The next day we heard Vincent Sombrotto, president of the National Association of Letter Carriers and its 233,000 members. That's right, a quarter of a million.

Jaquish's one-syllable answer got a big laugh, and we broke for the first lunch.

The next day we heard Vincent Sombrotto, president of the National Association of Letter Carriers and its 233,000 members. That's right, a quarter of a million.

Sombrotto was fiftyish, with white hair and a ruddy complexion. The former president of the New York branch of the union, he had a Jimmy Durante Brooklyn accent and just about as much charm. Everyone seemed to find him unexpectedly likable.

Sombrotto addressed himself, naturally, to the question of what should be the role of postal personnel in electronic mail. I got down just three quotes.

"It's da most effecient postal soivice in da woild."

"If da wave of da future is electronic transmission of mail, den it only makes sense to use da most efficient awganization in da woild."

"If dis seems self-soiving" (cheery grin), "dat's exactly what it's meant to do."

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CIRCLE 350 ON READER SERVICE CARD

Key Quotations

I. The New World

Bob Taylor of PARC: "If you think about these as systems for moving strings of characters, you miss the point of their power."

Sirbu: "Many people find that the filing and retrieval capabilities are the most useful."

Licklider of MIT: "[It's currently a problem of] access to gigabits through punybaud."

Neustadt of the White House: "Spectrum management will be the central issue of the 1980's," and "Can the FBI intercept messages?"

Kent of BBN: People say RSA code solves the key distribution problem. "But they lie."

Cunningham of Bell-Northern: "Once your letter is pushed through a mail slot, and a dog chews it, it's your problem."

McQuillan of BBN: "The great thing about standards is that there are so many of them."

Showalter of congressional staff: "We may not be able to teach congressmen C or Basic, but we may be able to fake 'em into thinking computers speak English."

Rose of congress: "I want Granny, at home with her video text, to be able to use this too."

II. The Post Office And, or In, the New World

Congressman Rose: "The U.S. congressman has many friends, and one of these is the U.S. Postal Service."

Sombrotto of the National Association of Letter Carriers: "It's da most effecient postal soivice in da woild," and "If da wave of da future is electronic transmission of mail, den it only makes sense to use da most efficient swganization in da woild," and "If dis seems self-soiving, dat's exactly what it's meant to do."

Joyce, consultant to the Post Office: "You're not going to see books and newspapers transmitted in the next twenty years," and "[In our estimates] We did not include the stimulation factor."

Jaquish of the Postal Service: "We *must control service*," and "We cannot allow our resources to be spirited away," and "We have a legislative mandate and a financial requirement."

Jackson of the FCC: "If they [the Postal Service] want to be involved in over-the-air bit streams, they have to get their radio licenses somewhere," and "I suspect this is something we'll have a lot of trouble with in our political system."

Anonymous professor with Arpanet connections, interviewed: "They [the Post Office] just don't understand this stuff and they don't know what they're doing."

Fritschler of the Postal Rate Commission: "The regulatory process can work, at least in this instance."

Zimmerman of the National Telecommunication and Information Authority: "You ought to be grateful that you don't get as much government as you pay for."

Anonymous consultant, interviewed: "I'm not interested in a Footnet." □

Mail Chauvinism, continued...

A Remarkable View

The most astonishing presentation was certainly that of Charles Joyce, formerly Director of Information Technology and Policy at the Mitre Corporation, and now consulting to the Post Office. He is a mumbler with a somewhat smug air and rather remarkable views.

Mr. Joyce had made a study of the "existing mailstream," that is, the things the Post Office delivers now. The question they tried to answer was what kinds of mail would be directly replaced electronically, or "diverted," according to this way of thinking.

The projections appear to hold approximately constant the number of messages per capita. The figures we saw foresee a slow drop in conventional mail as "generation two" and "generation three" get off the ground. And Joyce announces confidently: "You're not going to see books and newspapers transmitted in the next twenty years."

What makes him think the number of messages will stay the same? "We did not include the stimulation factor," he said.

Now this is most interesting: it assumes that each electronic message replaces a sheet of paper folded in an envelope, or some other enclosed packet of markings on cellulose. And it assumes a very constant universe. (Projections are often presented for varying sets of assumptions, none yet known to be true. No such fiddle-faddle here.)

Mr. Joyce's remarks were later commented on by Einar Stefferud, a consultant attending the conference:

"He wasn't considering the nature of the change of behavior. We aren't going to mail catalogs any more, there'll be query traffic."

"You're not going to see books and newspapers transmitted in the next twenty years."

Stefferud continued, "this rests on the assumption that electronic mail would be analogs or marginal equivalents of record traffic, but did not take into consideration the network transactions of Licklider's model—if you believe in networks."

Only time will tell, of course, but any observer would be reminded here of the projection made around 1947 that half-a-dozen of that day's computers (each with about the power of an Apple) would satisfy the United States for the foreseeable feature.

Or consider the market research of the Haloid Corporation, whose investigators repeatedly reported that the copying-machine Haloid was working on would only sell a few dozen before exhausting all the demand in the United States. (When the copier was finally introduced, Haloid changed its name to Xerox.)

The Friday lunch speaker was Lloyd Johnson, a poised and impressive individual, and staff director of the House of Representatives' Subcommittee on Postal Operations and Services. He sounded a less enthusiastic note for the Post Office than had Rep. Rose.

One of Johnson's first remarks was that everyone was proceeding from different assumptions, perhaps the best point made at the conference. He then went on to outline the history of the Post Office's maneuverings to institute electronic mail service, based on the notion that growing use of electronic messaging constituted "first-class mail diversion," as though someone were taking away what rightfully belonged to the Post Office, like the ball-point pens on chains.

Hair-raising estimates from various sources project staggering amounts of electronic communication. One commentator estimated that 220 million people would be sent ten items a day each averaging 30K bits per item. (Have you a better guess?) Vezza's earlier Congressional testimony had foreseen between 230 million and five billion electronic messages in *1983*, which would already be as much as *ten percent of the mail*!

CONTINUED ON PG. 150

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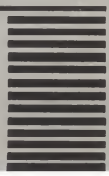

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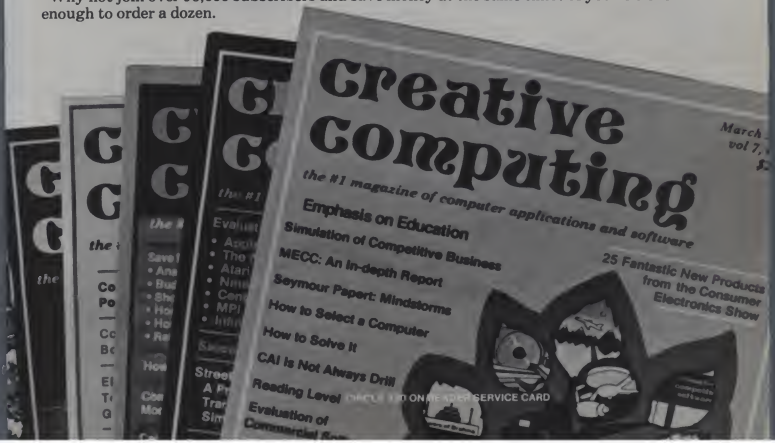
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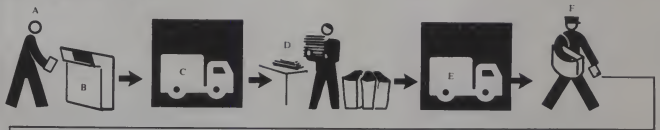
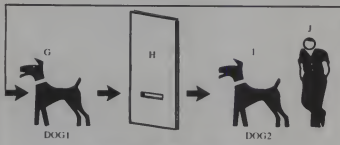
What's Who In All This

AFIPS American Federation of Information Processing Societies.
ARPA (now called DARPA) Advanced Research Projects Agency of the Department of Defense.
ARPA/IPT Information Processing Technology division of ARPA—original backers of computer graphics, time-sharing and packet nets.
Arpanet The defense-and-research packet net connecting numerous universities and defense locals.
BBN Bolt, Beranek and Newman, a frontier hotshot computer consulting and system design firm in Boston.
DARPA (New name of ARPA.) Defense Advanced Research Projects Agency.
DES Data Encryption Standard, supported by NBS and NSA.
ECOM or E-COM Electronic Computer-Originated Mail. Post Office trademark for their original proposal and that now under implementation. The migration of the rogue hyphen is inexplicable.
EMM Electronic Mail and Message System(s).
FAX Facsimile: pushing a picture through a wire with a converted analog signal.
FCC Federal Communications Commission.
IFIP International Federation for Information Processing. (A society of societies, like the U.S. AFIPS.)
ISO International Standards Organization.
MAC Project MAC (Man And Computer), pioneering time-sharing department at MIT (now become the Laboratory for Computer Science).
M&M (Electronic) Mail and Message; doesn't melt in your hand or disintegrate en route.
MIT Massachusetts Institute of Technology; a principal contributor to computer revolutions.
NBS National Bureau of Standards.
NSA National Security Agency, a huge government agency occupied with coding and decoding things. Their opposition to the RSA code has raised serious questions.
OSI Open Systems Interconnect, a proposed universal protocol framework.
PARC Xerox Palo Alto Research Center, a key hotshot location.
PO Post Office: the United States Postal Service.
PRC Postal Rate Commission, watchdog agency over the PO.
PS The United States Postal Service.
RSA Rivest-Shamir-Adelman code, supposedly unbreakable "trapdoor" code or "public-key cryptosystem." Two very long numbers mutually code and decode each other's results; if one is published, the other cannot be deduced in feasible time, and therefore remains secret. NSA opposition to RSA has been interpreted as sinister by some observers.
TELEX Brand name of a prevailing form of push-through digital printout message system.
TWX (TeletypeWriter eXchange.) Push-through digital printout message system operated by the phone company.
USC University of Southern California.
VAN Value-Added Network: digital service which somehow does more than time-share or transmit messages.
X.21 The circuit-switched data communication standard (where wires are reconnected for each transmission, as in the present-day phone system).
X.25 The packet data communication standard. □

Two Models of Mail





Classic Model of "Mail".

Sender (A) consigns letter to official postal receptacle (B) whence it is moved and processed by vehicles and sortings (C,D,E). Final delivery by letter carrier (F) goes all the way to addressee (J)'s receptacle (H). Post Office cares tenderly and bravely for letter all the way from B to H, symbolized by such perils as dog G. Any threats beyond H, such as interior dog I, are the problem of addressee J. Note the irony if DOG1=DOG2: up to the door he will be bested; beyond he may do what he will.

Naive Electronic Parallel, (omitting interactions, acknowledgements, queries, etc.)

Sender (A), sitting at screen (B), dispatches message from his computer (C). It enters electronic service (D), some collection of disks and gadgets and long wires and who knows what. The message is stored. Instantaneously or by and by it reaches the destined computer and screen (E,F) of addressee (G). But to whom does he complain if all he gets on screen F is garbage?

Is the thing still in D? What recourse has G if purveyors of service B contend that his computer E is a dog that has eaten his message? (Can G reply that the relationship of D to E is a virtual external DOG1 rather than a domestic internal DOG2?) □

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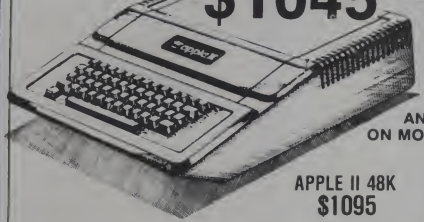

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Why The Post Office Thinks "Electronic Mail" Is Like Paper Mail

When any person meets the computer, he sees it in terms of his life up to that point, as a simpleminded genie to take over the drudgery of what he already does.

Mathematicians and engineers saw in it a fast numerical device, generals saw a bombardier, businessmen saw a billing machine, I personally saw a writing and movie machine. Now the Post Office looks, and Lo! they think it is a letter-transmission device.

Nobody is wrong in these perceptions. But to flesh out any of these visions well and rightly, you have to know a great deal more about the computer's other possibilities than was obvious at first.

Misled By the Word

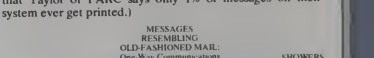
The phrase "Electronic Mail" is just as leading—and misleading—as so many other phrases and paradigms that have generated compiling computer visions and narrow-minded systems.

It is easy to see why the Post Office might get the idea that "electronic mail" is related to what they do already. Let us consider some of the superficial resemblances that might lead to this idea.

The word, to begin with. "Mail" sounds so familiar. But in some way this is falling prey to the sound of words, like wanting to put milk and sugar on a daytime serial.

"Packet" also sounds familiar. (Packets ordinarily go first class, right?) The terminology of the electronic packeters, too, sounds awfully like mail. A digital packet has private contents, an "envelope" of bytes, which includes the "address" and transport billing information, which is rather like a "stamp." But that's obviously just a superficial resemblance of the transport quantum.

(Amusing, too, and tying in with this simplified view, was IBM's presentation of the Math Conference of "output devices for electronic mail" as being *printers*, not screens; the *paper* is somehow thought to be fundamental. This despite the fact that Taylor or PARC says only 1% of messages on their system ever get printed.)



STORAGE, SPARKS AND "MAIL"

But essentially the "mail" concept of old is like only certain kinds of electronic messages: those which are not interacting with "agents," or part of highly interactive sessions; whose storage is deemed to be temporary; and which wait for their recipients, who are human beings, to read them, reply at leisure, and file them *elsewhere*.

It is impossible at this time to guess even vaguely what proportion of digital traffic will represent this old-fashioned kind of "mail." □

A Misleading Model

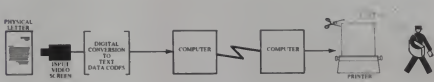
In the model repeatedly referred to by the Post Office representatives at the M&M conference, there are three "generations" of electronic mail. To their way of thinking, there is a natural progression from paper mail to a destined, but similar, electronic future. Let's look at this.

The idea of the telegram—more recently the "mailgram"—is indeed a form of electronic mail, well known to everyone: paper arrives at your office or front door. People who have seen conventional letters sent electronically may think that's it, that "electronic mail" means simply some shortening of the path.

Now it is certainly the case that the forthcoming ECOM system, discussed in this article, is mail in the ordinary sense; it has to be. It comes out on paper and is walked to your door. It does not come out on a terminal, it does not trigger electronic events. But what is misleading is the *extension* of that idea, the notion of Paper Destiny, that that's all there is. And that misleading extension is their model of electronic mail "generations."

The Generations

Generation One is called "paper in, paper out." This involves somehow getting a message into a computer, transmitting it electronically, printing it out, and delivering it on foot.



Hypothetical Generation I: "PAPER IN, PAPER OUT"

this is wholly impractical, since digital scanning and conversion does not work well in general. This brings us directly to Generation Two. "Electronic in, paper out," as in forthcoming ECOM.

Hypothetical Generation II: "ELECTRONIC IN, PAPER OUT"

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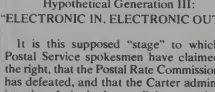
Misleading Model, continued...

By seeming logical progression, the supposed next step, "Generation Three," drops the paper and is "electronic in, electronic out."



Hypothetical Generation III:
"ELECTRONIC IN, ELECTRONIC OUT"

It is this supposed "stage" to which Postal Service spokesmen have claimed the right, that the Postal Rate Commission has defeated, and that the Carter administration forbade by explicit executive order.

But is it the next stage at all? Just because the preceding stages involved, of necessity, things that could be printed on paper, this next "generation" allows things that can't be usefully printed—such as animations—and can at once go beyond the transmission of letter-like alphabetical chunks to the shower-of-sparks model presented by the magicians. As Bob Taylor said, "If you think about these as systems for moving strings of characters, you miss the point of their power."

"Third Generation" Really Means Storage

Here is a real irony: the Post Office's "Generations" are based on the push-through idea, but actually what they call the Third Generation *must involve external storage*. A postman can always get to a mail slot in your door, even if it means fighting rain, sleet or gloom of night, or even if it means saying "Excuse me" to a crowd of people in the way. If the lines to your computer are busy, however, there is no way that message can be pushed through. Thus there must be provisions to store or buffer it externally until ready.

Moreover, in the event of a garbled message reaching your computer, there must be provision for re-verification. It is all very well to say, "Once the letter is pushed through your mail slot, and a dog chews it, it's your problem," but a letter that has been chewed by your dog, or accidentally trampled, spilled on, or perhaps inhaled by your vacuum cleaner, is nevertheless usually identifiable and readable, even if too icky to file. But bit-hash is another problem. If supposed messages are sitting in your computer when you get home and they are wholly meaningless and unidentifiable, there must be some way to ask your carrier for a replay.

But if you call in to that carrier's computer, how does it know you are not an imposter spying on you? What procedures give you a retry?

Well, these problems are essentially worked out on such systems as Arpanet and Tyme-Share. You call with your password and "open your mailbox," meaning that the disk storage of your message is unveiled to you; material is discarded when you give permission.

Well and good in a private-enterprise or research situation. But if a government supplier takes over the entire act, all these arrangements become more portentous and perhaps more sinister. You become not just a customer, but a *captive* customer. When dissatisfied under private enterprise, you have the option of going to another vendor; if it's the government you have the option of filing complaints and briefs, or not sending messages at all.

But, of course, most sinister is the notion that *your communications are being stored by a government agency*, even if it is the Good Ol' Post Office.

The Second Generation maintains a tie to the first. The "Third Generation," in its full realization, does not. (We might just as well call an automobile a Second Generation Horse-and-Buggy, and the comparison is pretty clear point by point. But when we get to calling an airplane a third generation Horse-and Buggy, we're in trouble. And I think it's the same for this model of generations.

The very term "mail diversion," used in some of the estimates of future electronic messaging, confirms this: if letters go down in quantity and digital transmissions go up, they call that "mail diversion." But is a phone call a "diverted letter?" No, it's *something else*.

The problem is in the frame of mind. The Post Office people seem to believe that fulltext transmission is the only model. To go beyond that, and recognize the panorama of remarkable interactive possibilities, requires a broad-scale knowledge of computers and all the things that they can do.

The remark of consultant Joyce, that "You're not going to see books and newspapers transmitted in the next twenty years," epitomizes this narrow focus. Of course, a book or newspaper is not sent electronically in full all at once. What happens is an interchange session with the *stored* document. And that is something very different.

Paradigm Shift

The original conceptual model was perhaps best stated by Herbert Simon in *The Shape of Automation*. In a nutshell Simon says that automation changes the shape of an activity so much as to make it a complete surprise. For example: if we talk about automating garbage *disposal*, visions might come to mind of prowling robot garbage trucks emptying the cans—but not of in-sink Disposalls, which involve changes all across the paradigm.

Whether a thing *can* be printed on paper may be the best dividing line between what usefully constitutes "mail" and what doesn't anymore. Text or bit-map pictures could be paper mail—but it is senseless to print executable programs or digitally explorable data bases and graphic structures. Fishlines to databases and text repositories, cascading interactive events, have nothing to do with mail as we know it. And these will be our next generation of library and communication. □

Mail Chauvinism, continued...

Other consultants foresaw twelve and a half billion pieces "diverted" in 1990, twenty-six billion in 2000.

So whatever it is, it's important. And it is not surprising that the postal workers are agitating for a piece of this action, which Johnson called "turfmanship," even though the General Accounting Office has estimated that "any loss" to the P.O. could be covered by attrition.

HUMPH: A Concluding Editorial Opinion

Some of the finest minds of our time are trying to build a new world of interactive communication and instantaneous availability of information, pictures, ideas, models, worlds.

Meanwhile the Post Office has come to assume, in some innocence, that electronic message services are directly related to, and in competition with, what they already do—the "same thing" as letters on paper.

Postal workers are agitating for a piece of the action.

This "turfmanship," as Lloyd Johnson called it, is strongly reminiscent of the typesetting-union problems faced by newspapers in the sixties, when the typesetters imagined that "new jobs" would be created in electronic typesetting to which they had a natural right—even though the *actual* new jobs involved computer programming, and were being carried out by vendors elsewhere. What is going to happen is *something different*.

There still exists the faint possibility that the Post Office might actually force a monopoly of its services in these new areas, based by some miraculous extension of law on its existing delivery monopoly. This possibility is slight, because compe-

CONTINUED ON PG. 156

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CIRCLE 158 ON READER SERVICE CARD

Five Snark Paradigms

At least five models of "electronic mail" can be discerned. I believe these constitute a more comprehensive view than those elsewhere called "Generation 1, 2 and 3." The real and overriding question is, what is the conceptual structure of this thing? And what are its boundaries?

1. *Push-through*. (Also called "forced delivery.") Some people seem to think electronic mail is a sort of telephonic scribe: from some kind of a sending unit, you dial up your addressee's receiving unit. If it is functioning and not busy, you push through a series of signals which the receiving unit records, usually on paper.

Several such systems already exist. One of these is facsimile (or Fax), the sending of pictures down a wire from one unit to another. To send a letter, you transmit *a picture of the letter*, an incredibly inefficient method which may take a minute or more.

Push-through alphanumeric systems are also popular: the TWX and Telex networks, widely used by businesses, effectively permit you, the sender, to type on an addressee's teletypewriter. As with Fax, the sender effectively seizes the recipient's machine during the time of transmission.

The question arises, however, as to whether such systems are "mail." They only permit as much material to be transmitted as there is time in the day, and they effectively force entry into a continuing scroll of material. One attendee, Einar Stefferud, puts it this way: "They aren't mail, they are forced-delivery systems. True mail requires a *mailbox*, a place the addressee can open at his leisure."

2. *Point-to-point*. These systems assume a sender and a receiver, and have a general resemblance to "mail" in its usual form. The transmission occurs in just one direction. A reply, if any, is expected in the *other* direction, but not as part of the same event or session.

According to this view, electronic mail is really just a simple transmutation of ordinary paper mail, going from one "drop" (where the sender puts it) to the addressee's mail drop (where a postman—or something—puts it).

Because much electronic mail seems to take this form, some people, including the Post Office, have been led to think that that's what electronic mail "is." Storage, buffering, acknowledgements, complex sessions and chain reactions are not taken into account.

3. *Repository Systems*. Rather than sending a message directly from A to B, it may be better to leave it on some other system, C, where it may be left until needed—or archived indefinitely.

The third-party system, C, may be a small file-server machine in an office, or such a large-scale service as Telemail, which stores mail on request as well as transmitting it. (This is analogous to both secretarial services and telephone-answering services.) Actually *most* "electronic mail" uses storage outside the recipient's own machine.

One of the most obvious reasons for doing this is safety. As Cunningham said, "Once your letter is pushed through a mail slot, and a dog chews it, it's your problem." Rather than having to worry about, or pay for, super-reliable equipment that won't lose your communications, it makes sense to pay a third party who's got the reliable equipment—possibly even the carrier—just to hold onto the message for you.

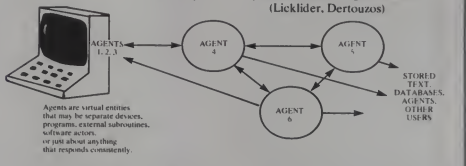
But there are other kinds of externalized messages. Links or mentions citing external files for optional pullout (as on the proposed Xanadu network) may also prove to be of great practicality: a letter no longer says "According to your communication of the 27th," but actually hooks to that communication so the reader may see at once what is being mentioned. "With reference to your letter on the 27th" becomes an actual link to the letter of the 27th. "With respect to our order number 3794" becomes, "with respect to" and then a link to the actual order itself, stored. These links cannot be usefully printed out; a fishline is for pulling, it is not a line on paper.

Expanding this in a slightly different way, a message may be built out of citations. It may cite and summon materials out of some data bank, the assemblage of these materials being the *real* message.

4. *Interactive sessions*. In this approach, the sending and receiving units remain coupled during an interaction, and indeed other units may join in the activity, in a "shower of sparks" responseplex. (See "The Magicians," described elsewhere.)

But here tradition is lost and we are in a new universe. In such a multifunction interchange of queries, requests, notifications, acknowledgements, links, contributions and invocations, among agents, data bases, personal files, programs, graphical displays, executable programs and subprograms, cascades of information chunks caroming in chain reaction, dancing demons and sprites, *there is no boundary between "mail" and active programs.*

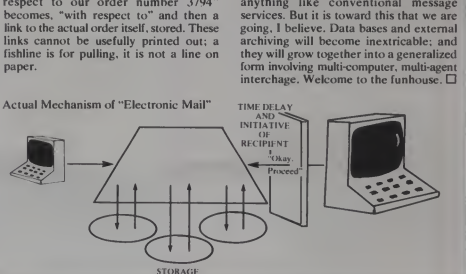
"Shower of Sparks"—Sophisticated Multi-Agent Session
(Licklider, Dertouzos)


AGENTS 1, 2, 3
AGENT 4
AGENT 5
AGENT 6
STORED TEXT DATABASES, AGENTS, OTHER USERS
Agents are virtual entities that may be separate devices, programs, external subroutines, software actors, or just about anything that responds consistently.

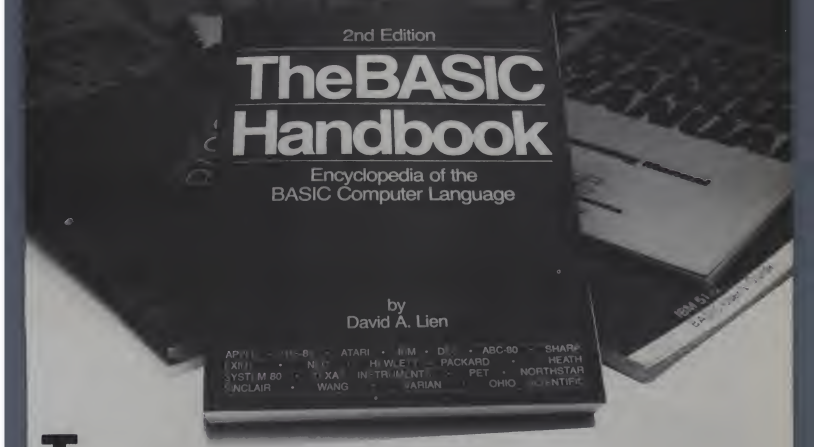
5. *High-Interchange with External Storage*. Combining types 3 and 4 gives us our final type, that which uses external files plus multi-agent interchanges on the Licklider model.

This paradigm is perhaps the most exciting to computer freaks, the most powerful for a variety of business functions, and the most unimaginably remote from anything like conventional message services. But it is toward this that we are going, I believe. Data bases and external archiving will become inextricable; and they will grow together into a generalized form involving multi-computer, multi-agent interchage. Welcome to the funhouse. □

Actual Mechanism of "Electronic Mail"



THE GREAT SIMPLIFIER!



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6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REQWTH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent G nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model

NAME	DESCRIPTION
53 FQEOWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability Index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project
59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRPINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVEMT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
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Nets, Messages and Arpanet

Computer networks, fondly called nets, are generally thought of as many computers connected by communication lines. And a user at a terminal, or personal computer, effectively connects to the whole net by hooking up to any one.*

Nets may hold data, which is sometimes "disributed"—spread out among the computers—and they may run programs for you. They also carry "electronic mail," which are really messages left on the disk drives somewhere in the network. A user of the net, when told he has "mail waiting" uses his password to cause the computer to show what's been left there for him.

Already vast numbers of such "electronic" messages—actually they are usually magnetic, but never mind—travel among individuals every day. The Old Guard who developed time-sharing really had no inkling that one of the principal uses of time-shared computing would be simply this forwarding of stored messages.

There are many network mail systems; almost all time-sharing systems offer something like a mail system. One of the most powerful is "Augment," offered by Tym-Share—the commercial version of Douglas Engelbart's two decades of pioneering designs at Stanford Research Institute.

The most influential computer net is the mighty Arpanet, a curious system of over a hundred computers across the country—at universities, research establishments and military installations. Financed by the Defense Department, it was originally conceived as a means by which defense-linked researchers could use the special facilities of each other's computers. This it is. However, to everyone's surprise, it has come about that the principal use of the Arpanet is as a message highway, carrying millions of transmissions and replies every day. (Many of these messages are programs and datapictes which cannot be usefully printed. Indeed, many of these "messages" are simply individual bursts in high-density interactive sessions in which two or more devices are participating.)

* A "net" can sometimes be just one computer. Indeed, in a way it could be argued that "net" is just a new word for time-sharing, the simultaneous use of big computers by many people.

The elite who use Arpanet think of it as their connection to an extraordinary universe of brilliant individuals—each other. Membership in this community is a vital part of the sense of identity of many people in it; and the idea of losing this connection is dreaded as a fearsome expulsion, like losing credit card privileges.

Nevertheless, there is talk that the Defense Department suspects it is paying for some usage which is not directly related to defense. (This is obviously true, but Arpanet is also an expanded experiment in high-tech informational community.)

In any case, the rug may one day be pulled out from many of these users, and as yet no service broad or powerful enough to replace it is on the horizon. □

Can the At-Sign Save Us?

There is already a convention for passing messages among nets, which is in use between certain of them. A user of one net may address a user at, say, Arpanet, as follows:

SNERD@ARPANET

"Snerd" being the registered password of an Arpanet regular, the nets will pass this message on through to Arpanet, which will in turn see to it that "Snerd" is informed of its being stored there.

It was argued in private by certain attendees of the M&M Conference that dangers posed by the Post Office to the hopes of sophisticated users could in some ways be mollified by this convention.

Suppose the PO obtained that most feared prerogative, a monopoly of "electronic mail." Nonetheless, if you are a member of a known net and addressed through that net—like SNERD@ARPANET—then that message would be diverted to your home net before it ever got into the PO net.

But this is cold comfort for those concerned with creating an exciting information society, not merely for the network elite, but for everybody. And unless the freakiest ideas can be tried on a competitive basis, we may never know what we would have really wanted. □

Mail Chauvinism, continued...

titors would not stand for it and customers would not stand for it—besides which, of course, there is the Reagan administration's stand against government services in general.

But most important, the Postal Rate Commission has in its wisdom given the Post Office that fraction of electronic communication which can be stuffed in an envelope.

However, that does not necessarily end the threat. The warnings of Henry Geller, for instance, centered on the difficulty of a mixed economy where the Post Office offered electronic services in competition with private vendors.

I see a different sort of threat: that the Postal Service might make electronic mail become what they think it is. And this could cripple us all for the indefinite future. At a point so early in the development of such services, it is astonishing that the Postal Service is already petitioning to make ECOM *permanent*. What if permanence had been legislated for the Ford Trimotor, the Eniac computer and the SOAP language?

The Postal Service might make electronic mail become what they think it is.

But it is in the further services the Post Office might offer—currently forbidden—that the danger lies. Even if they get no monopoly, by offering new services they have the power to structure an industry.

If the Post Office can, with flexibility, participate in this with as much foresight as those whose vision is driving it, then their participation will do no harm. But if Post Office participation means low-grade visions are to be foisted on the public, simplified and degraded forms of transmission that cripple the kind of interaction we are trying to create, these maneuverings are to be viewed with the greatest alarm by those who care about the world of tomorrow. Oversimplification and inflexibility could greatly reduce the imagination and power of tomorrow's evolving services. Let us hope the Post Office can find the wisdom to expand its understandings, and make an orderly contribution to the structure of our new life of the future, rather than a narrow, monopolistic impediment to the world some of us are trying to create.

Epilog

In "The Hunting of the Snark," the quarry all were seeking turned out to be that most horrible of beasts, the Boojum. If the finest visions are not shared as widely and clearly as possible, what Boojum may we not find? □

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CIRCLE 237 ON READER SERVICE CARD

Side by Side: Pascal and Basic

Al Evans

It may seem a bit heretical to describe a Pascal program in terms of a Basic program, but that's precisely what I'm going to do in this article. Most of us are used to Basic and fairly friendly with it. Pascal puts us in a new environment full of editors, filers, compilers, linkers, system libraries, segmented programs and external units.

It's important to realize that all these possibilities are provided for one reason: to increase the number of ways we can approach a problem. Pascal provides a rich and coherent field for programming: a structured system. On the level of the functional units of any given program, the differences between Pascal and Basic are less striking than the similarities.

Most of us are used to Basic and fairly friendly with it. Pascal puts us in a new environment.

Program Makemenu was orginally written in Apple Pascal as a general-purpose menu utility. The Pascal version should run on any UCSD Pascal system with minor reformatting (a 40-column screen is presently assumed). The procedure "Select" can be inserted directly into any UCSD Pascal program. The only entity which *must* be available to both the procedure "Select" and the calling routine is the Type "TextPage."

This menu uses the convention of moving a "pointer" with the right- and left-arrow keys. A carriage return (in Pascal, a carriage return or space) selects the item currently pointed to.

Most people find this type of menu faster and easier to use than the "pick a number" kind. It can be completely controlled with only 3 keys. Functions most often used can be placed near the top and bottom for rapid selection. A "wrap-around" display is used—the top item is one step below the bottom item and vice versa. Illegal entries are impossible, short of pushing RESET.

For purposes of demonstration and experimentation, Makemenu also includes a procedure to format input into an array of strings centered to print in the middle of a 40-column line. The main program allows you to format and select from a menu.

The Basic version of Makemenu is, as nearly as practical, a statement-for-statement translation of the Pascal program. I stopped short of using "non-standard" Basic practices which would be expensive in terms of memory and execution time. And I did not "strain" the Basic language to precisely duplicate the process of a statement when the same effect could be achieved more economically in Basic by altering the process.

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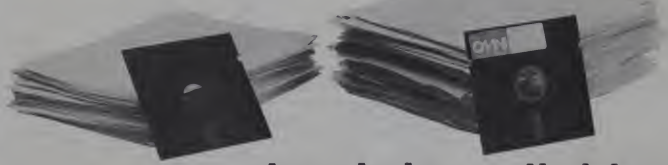

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CIRCLE 243 ON READER SERVICE CARD

In either language, Program Makemenu starts with a brief initialization section (lines 10-40 in the Basic program). This is followed by a jump to a main controlling routine (lines 10000-10700 in Basic, Main Program in Pascal). The main program lets you format a control menu with the routine Format (lines 1000-1900 in Basic, Procedure Format in Pascal), then displays the menu and accepts selections from it using the routine Select (lines 2000-2950 in Basic, Procedure Select in Pascal). Being a demonstration program, it then simply displays your selection and waits for you to continue or quit.

Let's follow the program step by step, beginning with initialization.

Initialization

Pascal programs start with declarations of global constants, types, and variables. "Global" means "defined everywhere within a program or procedure." The opposite of global is "local." Hold that thought for a few paragraphs—we'll come back to it.

Constants in Pascal are indeed constant. They remain the same throughout the program and from one run to the next. The only way to change them is to alter the source text and recompile the program.

In Basic, on the other hand (lines 10-15), their constancy is a function of the programmer's state of mind. For example, if you add

10025 MAXCHAR = 85

to the Basic program, you will be free to enter long lines when formatting your menu. This is guaranteed to produce incomprehensible effects.

Basic has nothing directly comparable to a type declaration. The variable types used in Basic are integer, real, and string, plus arrays of these types. In Pascal, a type might be defined as: Type Hicard=(J,Q,K,A); or Type Weekday=(MON,TUE,WED,THUR,FRI).

Later in the program, a variable of the type Weekday could only be assigned one of its defined values, just as an integer in the Apple can only be assigned a value between -32767 and 32767. Furthermore, these types are ordered. Just as the integer 1 is less than 2, the Weekday MON is "less than" TUE. Obviously, the possibilities are endless.

But in the present program, I have simply used the Type TextPage as a convenient word to stand for an array of 20 strings.

"Variable declarations" in Basic are optional (but considered good form). The Type of a variable is defined by its suffix (none for real, % for integer, $ for string). The Basic "DIM" statement on line 35 is approximately equivalent to the Pascal variable declaration MENU:TextPage. But there is one important difference, with the advantage going to Basic in this case.

As I mentioned before, PAGESIZE is actually a variable, rather than a constant, in the Basic program. We could add the line

20 INPUT "PAGESIZE: ";PAGESIZE

and change this constant on every run. Or we could CLEAR all variables later in the program, change PAGESIZE, and dimension the array again. This type of dynamic storage allocation is comparatively difficult in UCSD Pascal. In fact, it can't be done at all with arrays.

Controlling the Main Program

With initialization complete, we'll skip over the working routines to the controlling Main Program. Line 50 takes care of this in Basic; in Pascal it is automatic.

In Pascal, one major objective is to write Main Programs which are concise and easy to understand. Names of variables and procedures are selected carefully. If they are clear and meaningful, the Main Program can approach an English-language description of the process used to perform the task at hand. Ideally, a person not familiar with the program can read the Main Program section and gain a quick understanding of what is going on.

Of course, there is a good reason to do this in Basic, too. We are free to select appropriate names and use REM's to make the process obvious. Nor is it difficult to be obtuse in Pascal, but the dividing line is sharper. In Basic, we can at least always tell what actions the computer itself is performing. Unclear Pascal code borders on the completely incomprehensible.

Procedure Format

The first statement in the Pascal Main Program is Format(MENU). This statement does two things. First, it calls Procedure Format, serving exactly the same purpose as the GOSUB 1000 in the Basic program (line 10050). Second, it assigns MENU as the "parameter" passed to Format. The top line of Format reads:

Procedure Format(Var TEXT:Text Page);

This declaration means that 1 item is to be

```
1   REM  MAKEMENU BASIC:
2   REM  TRANSLATION OF PASCAL
3   REM  PROGRAM MAKEMENU
5 :
10  REM  CONSTANTS
15 PAGESIZE = 20:MAXCHAR = 36
20 :
25  REM  VARIABLES
30 MENUITEMS = 0:INDEX = 0
35  DIM MENU$(PAGESIZE)
40 CH$ = ""
45 :
50  GOTO 10000: REM  JUMP TO MAIN PROGRAM
55 :
60 :
1000  GOTO 1100: REM  PROCEDURE (ROUTINE) FORMAT
1005 :
1010  REM  PROCEDURE (SUBROUTINE) CENTER
1020 SPACE$ = " "
1030  FOR J = 0 TO  INT ((38 -  LEN (S$)) / 2)
1040 S$ = SPACE$ + S$
1050  NEXT J
1060  RETURN : REM  END OF 'CENTER'
1065 :
1100  REM  BEGIN MAIN BODY OF FORMAT
1150  HOME
1200  PRINT "**FORMAT A MENU**"
1250  PRINT
1300  PRINT "YOU MAY USE UP TO ";PAGESIZE;" LINES"
1350  PRINT "OF UP TO ";MAXCHAR;" CHARACTERS EACH"
1400  PRINT
1450  INPUT "ENTER NO. OF MENU LINES: ";MENUITEMS
1500  IF MENUITEMS < 1 OR MENUITEMS > PAGESIZE THEN  PRINT "BETWEEN 1 AND
     ";PAGESIZE;", PLEASE": GOTO 1450
1550  PRINT
1600  PRINT "ENTER EACH LINE OF MENU:"
1650  FOR I = 1 TO MENUITEMS
1700  PRINT I;". ";: INPUT "";MENU$(I)
1750  IF  LEN (MENU$(I)) > MAXCHAR THEN  PRINT "MAXIMUM ";MAXCHAR;" CHARAC
     TERS, PLEASE": GOTO 1700
1800 S$ = MENU$(I): GOSUB 1010:MENU$(I) = S$
1850  NEXT I
1900  RETURN : REM   END OF 'FORMAT'
1905 :
1910 :
```

passed to Format, that the item may be changed by the procedure ("Var"), that the item will be referred to as TEXT within the procedure, and that the item TEXT is in fact a TextPage (as compared to an Integer or String).

This makes it possible, within a single program, to Format(MENU), then Format(WINELIST) or Format(PROCEDURETABLE), presuming that these are all defined as TextPages.

Parameter-passing is more difficult in Basic; it must be explicitly defined by the programmer. I'll return to this subject. At this point, just note that the main body of the Basic Format routine (lines 1100-1900) refers directly to the MENUS array, while the same portion of the Pascal program [BEGIN (*Format*)... END; (*Format*)] refers to it indirectly as TEXT.

Actual processing in Format begins at the Pascal line which reads "BEGIN (*Format*)" (Basic line 1200). The program prints out the parameters to be used in making up the menu (Basic lines 1150-1400) and asks for the number of lines of text to be placed on the menu [Basic lines 1450-1500. Pascal lines REPEAT... UNTIL (MENUITEMS>=1) and (MENUITEMS<=PAGESIZE)].

Note the different approaches to range-checking. Pascal, as we all know, frowns on GOTO statements. Loosely, the Basic program says "Get it and check it; if it's wrong, go back and get it again." The Pascal program says "Just keep getting it until it's right." The results are the same.

The rest of the procedure is an indexed loop to fill each line in the menu with an entry from the keyboard. The loop is contained between FOR and NEXT in Basic, between BEGIN and END in Pascal. Again, note the different approaches to range-checking.

Subroutine Center

Just before the end of the loop is a call to a subroutine used to center each line of text [Center(TEXT[I]) in Pascal, line 1800 in Basic]. In Pascal, TEXT[I] is passed as a variable parameter to Center. Center refers to this string as "S." Line 1800 of the Basic program shows how such parameters can be passed explicitly in Basic. This is fairly simple for a string or numeric variable. Obviously, it would be more complicated to pass an entire array in this manner, although it is completely possible.

As I mentioned above, Pascal refers indirectly to the menu array as TEXT by the use of parameter-passing. To do the same in Basic, we would have to add the statements

```
FOR I = 1 TO PAGESIZE
TEST$(I) = MENU$(I)
NEXT I
```

The inverse operation would be required after formatting was complete.

This would often lead to a disproportionate increase in time and memory required for a Basic program. I therefore considered it against the "rules" of this program translation.

In any case, the procedure/subroutine Center simply adds spaces to each string entered in the menu to center it on the screen. In doing so, it brings us back to the distinction between global and local variables.

Note that the Pascal Procedure Center uses "I" as a loop control variable, even though "I" is the variable controlling the loop from which the procedure is called. "I" is declared as a variable in both the heading for Format and the heading for Center. The variable "I" declared in the Format heading is "local" to the procedure Format. It does not exist anywhere else in the program. The "I" declared as a variable in Center is local to Center. It does not exist anywhere else in Format or, or course, anywhere in the main program. (You Pascal programmers know that Format's "I" would exist in Center if it were not superceded by a local declaration, but that's beyond the scope of this article.)

This distinction between global and local variables makes it possible to add procedures to a Pascal program and know that they will not change variables which might later be used somewhere else with unexpected results. There is no such distinction in Basic. Another variable ("J" is this case) must be used to control the subroutine in lines 1010-1060.

The Pascal operator "DIV" is simply an integer version of "/." Line 1030 of the Basic program has the same effect.

The Format routine checks each line for length as it is entered and centers it. When MENUITEMS strings have been entered, Format has completed its operation and passes control back to the main program.

The main program now enters a loop which will be repeated until something other than a "C" is entered at its end.

```
      PROGRAM MAKEMENU;

  Const PAGESIZE=20;
        MAXCHAR=36;

  Type TextPage=Array[1..PAGESIZE] of String;

  Var MENUITEMS,INDEX:Integer;
      MENU:TextPage;
      CH:Char;

      Procedure Format(Var TEXT:TextPage);
      Var I:Integer;


        Procedure Center(Var S:String);
        Const SPACE=' ';
        Var I:Integer;

        BEGIN
         For I:=0 to (38-Length(S)) DIV 2 do
             S:=Concat(SPACE,S)
        END; (*Center*)


      BEGIN (*Format*)
       Page(OUTPUT);
       Writeln('**Format a Menu**');
       Writeln;
       Writeln('You may use up to ',PAGESIZE,' lines');
       Writeln('of up to ',MAXCHAR,' characters each.');
       Writeln;
       REPEAT
        Write('Enter No. of Menu Lines: '); Readln(MENUITEMS);
        If (MENUITEMS<1) or (MENUITEMS>PAGESIZE)
         Then Writeln('Between 1 and ',PAGESIZE, ', please')
       UNTIL (MENUITEMS>=1) and (MENUITEMS<=PAGESIZE);
       Writeln;
       Writeln('Enter each line of menu:');
       For I:=1 to MENUITEMS do
         BEGIN
           REPEAT
            Write(I,'. ');Readln(TEXT[I]);
            If Length(TEXT[I])>MAXCHAR
            Then Writeln('Maximum ',MAXCHAR,' characters, please.')
           UNTIL Length(TEXT[I])<=MAXCHAR;
           Center(TEXT[I])
         END;
      END; (*Format*)
```

Side by Side, continued...

Procedure Select

This loop sets INDEX to point to the first item on the menu and calls the Procedure Select (Basic lines 2000-2950). Once again, note the technique used to pass parameters in Basic (line 10150). The array itself is not passed for the same reason as before.

Procedure Select sets TOP to center the menu vertically on the screen, calls a subroutine to display it (Pascal Procedure Display, Basic lines 2010-2070), and uses arrows to point to the top item on the menu (Pascal Procedure Markitem, Basic lines 2110-2170). Note that the variable names used in the two languages are slightly different.

In Basic, I could not use POINTER or TOP as variable names. They contain the reserved words INT and TO. Furthermore, in Applesoft and many other versions of Basic, OLDINDEX and OLDPOINTER would refer to the same variable, as the first two letters are the same. In UCSD Pascal, the first eight letters of a variable name are significant.

The same programming problem can be solved very similarly in two reputedly-dissimilar programming languages.

```
2000  GOTO 2200: REM  PROCEDURE (ROUTINE) SELECT
2005 :
2010  REM  PROCEDURE (SUBROUTINE) DISPLAY
2020  HOME
2030  HTAB (1): VTAB (TP)
2040  FOR I = 1 TO ITEMS
2050  PRINT MENU$(I)
2060  NEXT I
2070  RETURN : REM  END OF 'DISPLAY'
2075 :
2110  REM  PROCEDURE (SUBROUTINE) MARKITEM
2120 LEFT = 1:RIGHT = 39
2130  HTAB (LEFT): VTAB (TP - 1 + OINDEX): PRINT "  "
2140  HTAB (RIGHT): VTAB (TP - 1 + OINDEX): PRINT "  "
2150  HTAB (LEFT): VTAB (TP - 1 + INDEX): PRINT "=>"
2160  HTAB (RIGHT): VTAB (TP - 1 + INDEX): PRINT "<="
2170  RETURN : REM  END OF 'MARKITEM'
2175 :
2200  REM  BEGIN MAIN BODY OF SELECT
2250 TP =  INT ((24 - ITEMS) / 2)
2300  GOSUB 2010: REM  DISPLAY
2350 INDEX = PTR:OINDEX = PTR: GOSUB 2110: REM    MARKITEM
2400  GET CH$
2450  IF CH$ =  CHR$ (13) THEN  GOTO 2950: REM   JUMP OUT ON C/R
2500 OPTR = PTR
2550  IF CH$ <  > CHR$ (21) THEN  GOTO 2700: REM   RIGHT ARROW
2600 PTR = PTR + 1
2650  IF PTR > ITEMS THEN PTR = PTR - ITEMS
2700  IF CH$ <  > CHR$ (8) THEN  GOTO 2850: REM   LEFT ARROW
2750 PTR = PTR - 1
2800  IF PTR < 1 THEN PTR = PTR + ITEMS
2850 OINDEX = OPTR:INDEX = PTR: GOSUB 2110: REM  MARKITEM
2900  GOTO 2400
2950  RETURN : REM  END OF 'SELECT'
2955 :
2960 :
2965 :
10000  REM  MAIN PROGRAM
10050  GOSUB 1000: REM   FORMAT
10100 INDEX = 1
10150 ITEMS = MENUITEMS:PTR = INDEX: GOSUB 2000: REM   SELECT
10200  HOME
10250  HTAB (1): VTAB (8)
10300  PRINT "ITEM SELECTED WAS:"
10350  PRINT
10400  PRINT MENU$(INDEX)
10450  PRINT
10500  PRINT "PRESS 'C' TO CONTINUE"
10550  PRINT "ANYTHING ELSE TO QUIT"
10600  GET CH$
10650  IF CH$ = "C" THEN 10100
10700  END
```

Otherwise, the operation of Display and Markitem is the same in either language.

Procedure Select now reads a character from the keyboard [Read(KEYBOARD,CH) in Pascal, line 2400 in Basic]. We are interested in only three characters: left arrow, right arrow, and carriage return. (For reasons beyond the scope of this article, Pascal considers a carriage return to be the same as a space when only a single character is being read.)

A carriage return sends us back to the Main Program, with INDEX set to the menu position of the item selected. A right arrow moves the pointers one step down the display (increasing the present value of INDEX by 1). A left arrow moves them one step up. No other entry has any effect on the program, the arrows, or the value of INDEX. In any case, the display is updated by Markitem according to the character read.

Slightly different loops are used to perform these functions in Basic and Pascal [Basic lines 2400-2950, Pascal "Then REPEAT...UNTIL CH=CHR(32)].

The main difference is that Pascal makes it possible to execute conditionally any number of actions based on the results of a comparison (If...Then BEGIN...END). In Basic, I achieved the same result by reversing the comparison and using GOTO to skip over the actions NOT to be taken (for example, line 2550).

The other difference is the fact that the statement Read(KEYBOARD,CH) is repeated twice in the Pascal program. This is usually necessary in Pascal, and is a side-effect of not using the command GOTO. The first read (outside the loop) is used to determine whether to enter the loop at all. The second (at the bottom of the loop) is used to determine whether to exit the loop. This is perfectly reasonable, but seems peculiar at first.

When you make a choice and press <RETURN>, Select passes control back to the Main Program, along with the new value of INDEX [line 2950 in Basic, END; (*Select*) in Pascal]. Subsequent operation is exactly the same in Pascal and Basic; the program clears the screen, prints out the menu line you selected to prove it is operating correctly, and asks whether you want to choose again.

In a real Basic program, the action taken at the point of return would be determined by a statement such as

ON INDEX GOSUB 3000,4000,...

The same selection process is accomplished in Pascal by

```
Case INDEX of
  1: Procedure1
  2: Procedure2
  3: etc.
END; (*Cases*)
```

```
    Procedure Select(TEXT:TextPage;ITEMS:Integer;Var POINTER:Integer);

    Var  OLDPOINTER, TOP:Integer;
         CH:Char;


      Procedure Display;
      Var I:Integer;

        BEGIN
         Page(OUTPUT);
         Gotoxy(0,TOP);
         For I:=1 to ITEMS do Writeln(TEXT[I]);
        END; (*Display*)


      Procedure Markitem(INDEX,OLDINDEX:Integer);
      Const LEFT=0;
            RIGHT=38;

       BEGIN
        Gotoxy(LEFT,TOP-1+OLDINDEX); Write('  ');
        Gotoxy(RIGHT,TOP-1+OLDINDEX); Write('  ');
        Gotoxy(LEFT,TOP-1+INDEX); Write('=>');
        Gotoxy(RIGHT,TOP-1+INDEX); Write('<=')
       END; (*Markitem*)


    BEGIN (*Select*)
     TOP:=(24-ITEMS) DIV 2;
     Display;
     Markitem(POINTER,POINTER);
     Read(KEYBOARD,CH);
     If CH<>CHR(32)       (*<RETURN> or <SPACE>*)
     Then REPEAT
            OLDPOINTER:=POINTER;
            If CH=CHR(21) (*Right arrow*)
            Then BEGIN
                   POINTER:=POINTER+1;
                   If POINTER>ITEMS
                   Then POINTER:=POINTER-ITEMS
                 END;
            If CH=CHR(8)  (*Left arrow*)
            Then BEGIN
                   POINTER:=POINTER-1;
                   If POINTER<1
                   Then POINTER:=POINTER+ITEMS
                 END;
            Markitem(POINTER,OLDPOINTER);
            Read(KEYBOARD,CH);
          UNTIL CH=CHR(32)   (*<RETURN> or <SPACE>*)
    END; (*Select*)

BEGIN (*MAIN PROGRAM*)
 Format(MENU);
 REPEAT
  INDEX:=1;
  Select(MENU,MENUITEMS,INDEX);
  Page(OUTPUT);
  Gotoxy(0,0);
  Writeln('Item selected was:');
  Writeln;
  Writeln(MENU[INDEX]);
  Writeln;
  Writeln('Press "C" to continue');
  Writeln('Anything else to quit');
  Read(CH);
 UNTIL (CH<>'C') and (CH<>'c')
END.
```

Conclusion

And so I have shown that the same programming problem can be solved very similarly in two reputedly-dissimilar programming languages. In this particular case, neither seems to have any particular advantage over the other. This apparent equivalence is somewhat misleading.

While I have used a fair percentage of the "power" of Basic (defined in terms of the constructs and actions possible), I have hardly scratched the surface of UCSD Pascal. The brief discussions of type definitions and parameter-passing give only hints of the capabilities of this language.

There are several additional types of loops—all the string functions of Basic and a few extras, completely recursive multiline functions. There are "file" and "record" type variables. Long programs can be broken down into "segments" which are loaded from disk only when they're needed.

But the point of this article is that I was not required to use any of the unfamiliar structures of Pascal to write a useful program. They are simply available. And they will still be available when I am writing a program which cannot be so easily translated into Basic. □

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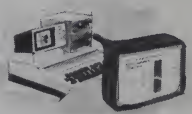

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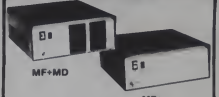

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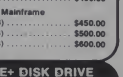

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BASIC BEATS PASCAL

Jacob Ever

We hear a lot about the virtues of Pascal and structured programming, and the impending obsolescence of Basic. This article presents another view.—EBS

Most personal computers are programmed in Basic. In many cases the language is built into the read only memory of the machine. As a result most users of small computers learn Basic as their first, and sometimes their only, language. In the October 1980 survey of *Byte* magazine almost 50% of the readers indicated that they use Basic frequently, and close to 90% indicated occasional or intended use.

Yet computer language experts argue that Basic is a bad language. I have even heard it called a "spaghetti" language. This does not indicate that Basic has the elegance and style of the Italian language. No, quite the contrary might be true. The term actually refers to the control structure of the language. If one traces with a pencil the lines being executed in a Basic program, in sequence of execution, one ends up with lines crisscrossing one another. Not unlike a bowl of pasta. This is due to the many GOTOs, or branches, that one typically encounters in a Basic program.

Jacob Ever, 175 Ivy Hill Cr., Rye Town, NY 10573.

The spaghetti syndrome, it is argued, makes the program difficult to read and, therefore, difficult to maintain. This is contrasted with the smooth flow of a "structured" language such as Pascal. One can usually write a program in Pascal without any jumping around, i.e. without GOTOs. Some versions of Pascal have branching only as a discouraged option.

Will the superior qualities of Pascal win out over the popularity but poor structure of Basic?

Furthermore, most Basics do not allow explicit naming of objects. For example, a variable in Basic usually has a two character name, the first being alphabetic. This makes reading a Basic program a feat of memorization. It is a well known fact that short term human memory can hold only six or seven items. Therefore a program that contains more than a few non-mnemonic names is indigestible, again reminding one of the aforementioned bowl of noodles.

Finally, almost all Basics are interpretive. That means that the lines of the program are translated into machine instructions as they are encountered during the running of the program. In a loop that is executed many times, the interpreter figures out each time separately the action to be taken based on the stated instructions. This is slow!

Before getting my personal computer, a Northstar Horizon, I read many articles on this subject in the pages of this and other computer publications. It was stated repeatedly that now that Pascal is widely available, the days of Basic are numbered. Therefore, I resolved that Pascal would be the language that I would use for programming my applications. Unfortunately it was several months before I could lay my hands on a UCSD Pascal compiler so I fell back to programming in Northstar Basic. Later I had a chance to program in Microsoft Basic. By the time I learned Pascal, I became interested in comparing the various languages in a given application.

The application I chose for comparison is a word processor which I called Simpleword. Simpleword is a full screen editor which is simple to learn, yet has a full range of editing features. I programmed it in Northstar Basic (NBasic), in Microsoft Basic (MBasic) and Pascal. The article is the result of my experiences in writing Simpleword.

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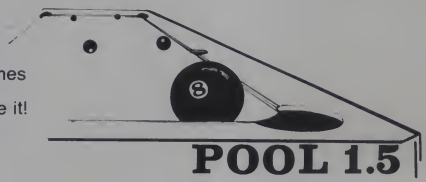

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Pascal

```
Program Test;
const nol=300
var  i:integer;
     ar:array[1..nol] of string[26];

Procedure create;
begin
  ar[1]:='abcdefghijklmnopqrstuvwxyz';
  for i:=2 to nol do
    a[i]:=ar[i-1]
end;

Procedure replace;
begin
  for i:=1 to nol do
    ar[i,pos('z',ar[i])]:=chr(13)
end;

Procedure print;
begin
  for i:=1 to nol do
    write(ar[i])
end;

begin (* main *)
  create;
  write(chr(7)); (* ring bell *)
  replace;
  write(chr(7));
  print;
  write(chr(7));
end.
```

Nbasic

```
100 DIM P$(7800)
110 REM Create
120 PRINT CHR$(7)
130 FOR I=1 TO 7774 STEP 26
140 P$(I,I+26)="abcdefghijklmnopqrstuvwxyz"
150 NEXT I
160 REM Replace
170 PRINT CHR$(7)
180 FOR I=1 TO 7800
190 IF P$(I,I)="z" THEN P$(I,I)=CHR$(13)
200 NEXT I
210 REM Print
220 PRINT CHR$(7)
230 PRINT P$
240 PRINT CHR$(7)
250 END
```

Mbasic

```
100 clear 10000
110 nol=300
120 dim P$(nol)
130 ' Create
140 print chr$(7);
150 P$(1)="abcdefghijklmnopqrstuvwxyz"
160 for I=2 to nol
170 P$(I)=P$(I-1)
180 next I
190 ' Replace
200 print chr$(7);
210 for I=1 to nol
220 mid$(P$(I),instr(P$(I),"z"),1)=chr$(13)
230 next I
240 ' Print
250 print chr$(7);
260 for I=1 to nol
270 print P$(I)
280 next I
290 print chr$(7);
300 end
```

Figure 1.

Performance

Why should one be concerned about the performance of a language? Well the only time one should pay any attention to this area is when the system response time is bothersome (i.e. when it affects productivity). In Simpleword one first enters text. In my experience, one almost simultaneously starts changing it. Let me address the performance aspects of each one of these operations separately.

When it comes to entering text, all languages are fast enough to pick up the input as fast as it is typed in. Even a touch typist is satisfied with the capability of the languages to accept input. This is very important since a slowdown in this area can have a major impact on the usefulness of a text editor.

When it comes to editing, the picture is mixed. Northstar Basic turns out to be slow when editing requires searching a string of text. It is interesting to note that in a recent performance test done by the Association of Computer Users and published in *Computer World*, Northstar Basic outperformed several machines costing many times more.

However, when it comes to word processing, NBasic has two disadvantages: 1) lack of built in string searching function; 2) primitive string storage facilities. So I devised a series of benchmark tests that compare the three languages in their ability to handle a typical word processing application.

Before describing the benchmarks and the results, let me spend a moment on text storage. If asked to identify a basic unit of text, most people will say a word or, possibly, a sentence. Yet most word processing systems use a character or a line as a basic unit. Simpleword is a character-oriented word processor, yet it has to be aware of lines, since lines are the unit printed or displayed at any given time.

In NBasic the working text is stored as one long string. The program has to have the intelligence to break up the long string into individual lines. An empty line is simply stored as a line full of blanks. This takes a lot of space and is cumbersome to handle. Pascal as well as MBasic allows storing the text as an array of lines.

MBasic is particularly adept at storing individual lines in a very economical manner. It reserves space only for the characters that are actually contained in the lines. Pascal on the other hand stores every line as if it contained a full complement of characters. Thus, an empty line occupies a full line of space in Pascal, but not in MBasic.

The text handling benchmark creates a text with 300 lines, each one containing the complete alphabet. The next module searches each line, replacing the last character in the line with a carriage return. Finally the complete text is displayed. So the text consists of three modules: create,

	Nbasic	Mbasic	Pascal
Create	4	2	2
Replace	55	2	2
Print	8	9	8
Total	67	13	12

Figure 2. Run time in seconds.

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replace and print. Figure 1 shows the program as implemented in Pascal, NBasic and MBasic. There are obvious differences in program readability, but this will be explored in a subsequent section. Figure 2 shows the results of executing the three programs on a Northstar Computer. NBasic running native on the machine while MBasic running under CP/M.

It is interesting to note that there is almost no difference in execution time between MBasic and Pascal. The fact that MBasic is fully interpretive while Pascal is partially compiled is dwarfed by the availability of a built-in string searching function. On the other hand, NBasic suffers for not having such a capability.

My conclusion from the performance test and practical experience in running all three word processors is that any one is satisfactory as an input device. NBasic is lacking in editing performance, but this could be overcome by augmenting it with an appropriate machine language routine. However, NBasic also takes a lot of memory for text storage.

MBasic and Pascal were about equal in performance, with an edge for MBasic in storage economy. The more important question, however, is the simplicity, readability and ease of maintenance of programs written in the two languages. More on this in the next section.

Language Structure

Here is the crux of the matter: Will the superior qualities of Pascal win out over the popularity but poor structure of Basic? Trying to answer this question, one runs immediately into a "basic" difficulty (pardon the pun—it just slipped out). The problem is that there is no one Basic. Even in this limited sample there are two Basics from which to choose: MBasic from Microsoft and NBasic from Northstar. The following is a comparison of the three languages in terms of ease of writing and ease of changing a program.

The system aspects of Basic were the determining factors in choosing it over Pascal.

Scanning the programs in Figure 1, it is obvious that Pascal has the best readability index. Unfortunately, there is no such index, but the point is still valid. The Basic programs require comments to make them readable; Pascal with its explicit names is usually self-explanatory.

In the benchmark program there is no need for any GOTOs, but in the actual implementation of Simpleword in NBasic there are quite a few of them. Interestingly, in the MBasic version there are none. This is because MBasic implements the IF...THEN statement differently from NBasic.

Specifically, in MBasic THEN can be followed by multiple statements. This capability can be used to approximate a limited block structuring. To illustrate, let's take a very ordinary situation of a program where the value of an input determines a set of actions. Figure 3 is an implementation of such a program in the three languages.

Now NBasic requires two branches to implement the logic of this program. Maybe one could reduce it to one with some performance penalty; but it is remarkable that MBasic does not require any branches for the same program. However, the program is still difficult to read due to the unrevealing nature of the GOSUB statement. GOSUB 1000 is as obscure as a moonless night. To overcome this handicap, one is forced to add comments to the text. Even more are needed in the NBasic program because of the potentially confusing GOTOs.

Interestingly, one can achieve the same readability in the Pascal version of the program without any comments whatsoever. One reason, no doubt, is the superior structure of Pascal, but equally important is the ability to use explicit names. Most Basics allow any name as long as it fits into two alphanumeric characters, the first always being alphabetic. There are limitations on how much intelligence can be crammed into two characters.

After a lot of thought I decided to write the final version of Simpleword in MBasic. From the foregoing it was clear that I could write in a straightforward, "structured" manner. And indeed the MBasic version of Simpleword, with 150 lines of code, does not need the crutches of any branching statement. To overcome the readability problem, I added a comment next to every GOSUB call—all 25 of them—and I documented, in a dictionary at the beginning of the program, all the important variables. Then I wrote a small program that eliminated all remarks from the final, production version of the program. This is a space-saving feature since in Basic, unlike Pascal, remarks do occupy valuable storage space during execution.

Of course, the obvious question is: why bother? Write the program in Pascal to start with! Yes, indeed. But there is a catch. This relates not to the language features of Pascal, which are indeed superb, but to the systems aspects of Pascal as compared to MBasic. Let me explain.

Figure 3.

```
        Mbasic

100 for J=1 to 100
200 input I
300 if I=1 then gosub 1000: next J: ' Read a line
400 if J>1 then gosub 2000: ' Write a line
500 if J=9 then print "end": end
600 next J


        Nbasic

100 FOR J=1 TO 100
200 INPUT I
300 IF I=1 THEN GOTO 700 \ REM Read a line
400 IF I>1 THEN GOSUB 2000 \ REM Write a line
500 IF I=9 THEN EXIT 900 \ REM End
600 NEXT J
700 GOSUB 1000 \ REM Read a line
800 NEXT J
900 PRINT "end" \ END


        Pascal

Program readwrite;
var i:integer;
begin
  repeat
    read(i);
    case i of
      1:readline;
      2:writeline;
    end
  until (i=9);
  writeline
end.
```

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Allow one character to overlap another (ø).
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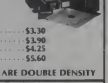

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Basic Beats Pascal, continued...

The System

When one writes a program, one actually interacts with two environments—sometimes more. One is the environment of the language one uses, in this case Basic or Pascal, and the other one is the system environment which includes everything else besides the language itself. The latter is usually ignored when discussing alternatives, with all attention focused on the attributes of the language. Yet it is an important aspect of writing, debugging and then running a program.

As I indicated, the system aspects of Basic were the determining factors in choosing it over Pascal. To explain what I mean let's examine the process of writing and debugging a program. One writes the source statements using a text editor of some sort. In Basic one can use the integrated text editor that is a part of the package. The very next step can be the start of a test run. In Pascal on the other hand one first explicitly invokes the text editor. Then the source code is stored. Next the compiler is run. Then finally the test run can start.

This is a time-consuming process during the debugging phase when, at least in my case, many errors are found and require corrections; but then even finding a bug can be very tiresome in Pascal. The compiler gives one very good pointer for syntax errors, but if an execution error is encountered watch out! You are on your own. My version of Pascal gives a cryptic message like P#5 S#12 E#28. And don't try to find an explanation in the manual (PAS-DOC Revision 1). I tried, but did not find any. I presume that the good people in San Diego thought it best to keep a few secrets to themselves.

Basic also allows one a fair degree of freedom for controlling the system resources. This is very important if one wants to make the program easy to use. For example MBasic allows error trapping. In Simpleword, the user is asked for the name of the file where the text to be edited is stored. If the file name is not found in the directory, one gets an error message and the program aborts. This can happen in Pascal or in MBasic. But in the latter, the error can be trapped by the program, which can then ask the user to please re-enter the name as it cannot be found in the directory.

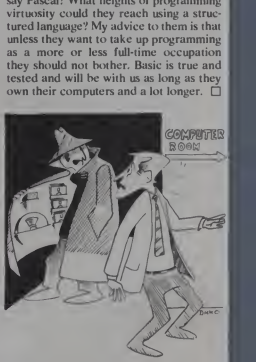
Another example is the FRE function in MBasic. It gives the amount of space remaining for storage of text strings. Using this function the program can be aware when space is running short and gives the user a chance to store his text before the inevitable program termination due to lack of space. There are other statements and functions that give an MBasic programmer a tighter control over his environment than that accorded to the Pascal programmer.

Conclusion

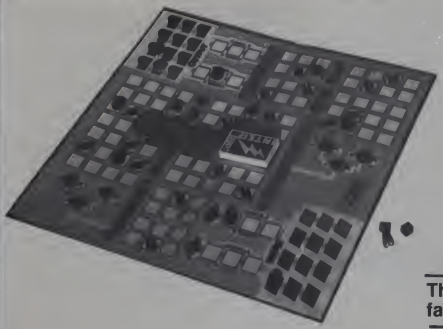
Of the three languages compared, Northstar Basic, Microsoft Basic and UCSD Pascal, Northstar Basic was rejected first due to performance and language deficiencies for text processing application. Pascal was found, not unexpectedly, to have the best language features. However, to my surprise, I found the better system capabilities of Microsoft Basic outweighed the language advantage. So MBasic was chosen as the vehicle for implementing my text editor Simpleword.

My conclusion is that rumors of the imminent demise of Basic are premature. The latest version of Microsoft Basic (version 5) has, I understand, explicit naming capabilities and better control structures. So I expect that many personal computer users will continue to use it as happily as they have in the past. Basic has a simplicity that is still very attractive—this not only at the language level, but from the system point of view as well. Its interpretive nature allows for very easy debugging. Its performance, at least for my application, compared very well with that of Pascal, and Basic allows the programmer to manipulate the system resources as well.

Many of my friends, casual personal computer users rather than professional programmers, use Basic to write programs for fun and sometimes even for profit. The language is perfectly adequate for their needs, but yet they have a grawing doubt. Should they use a 'better' language—say Pascal? What heights of programming virtuosity could they reach using a structured language? My advice to them is that unless they want to take up programming as a more or less full-time occupation they should not bother. Basic is true and tested and will be with us as long as they own their computers and a lot longer. □



"Psssst—buddy!! Want a see some quick and dirty programs?"



High Roller

Three binary dice add up to fast fun and easy winnings

Binary dice? That sounds strange. What's the point?

Each binary die has six sides but instead of one to six spots, three sides have the numeral one and three have a zero. When rolled, the three dice, red, blue and green, produce a 3-bit binary number.

The binary number can be easily converted to a decimal numbr. A binary 101 equals a decimal 5. After using these dice a few times, these conversions are quickly done even by 7 year olds.

Designed for Understanding

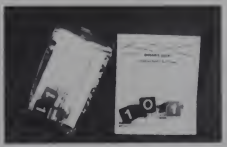
Binary dice are just one of many unique elements of the *Computer Rage* board game. The whole game is designed to help players easily understand the complexities of a large multiprocessing computer system while having great fun playing.

Imagine you're using a large computer along with many other users. It's Thursday and payroll checks have to be run. They have priority over your job. When this happens in the game you lose a turn. But then a vice president wants the results from the program you're working on—take another turn. Oh, oh, in your hurry, you make a program mistake. Too bad—return to the last checkpoint.

Meanwhile one of your opponents, a fellow user of the computer, has heard from the president that one of his three programs has top priority; it advances to the output queue. But wait, on your next move you land on an "interrupt" and find that a brownout has just occurred, the computer has crashed, and all the programs of all players must return to the last checkpoint.

The binary dice return to your opponent. He rolls 011, a four, and lands on a decision point. Rolling one die he gets a 1 which means he takes an 8-step flow intead of a 16-step one.

One it goes until one of the two to four players gets all of his programs to the output printer and wins.



Sets of three binary dice used in Computer Rage are available separately.

Sturdy Components

The game comes with a colorful, big 19" x 19" playing board, 38 interrupt cards, 12 miniature disk pack playing pieces (3 for each player) and 3 binary dice. A supplement to the rules describes the way in which *Computer Rage* parallels a multiprocessing system.

Computer Rage is designed for players from 7 to 14 years old but obviously can be played by adults as well. It is for two to four players. Many schools use the game along with a book such as *Be A Computer Literate* in computer literacy units for Grades 3 to 8. It's also an excellent game to have available in open or alternative classrooms.

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In fact we feel so strongly that *Computer Rage* should be in every school that we're offering a special discount to schools and to people who buy a game for a school.

The price of one game is $8.95 postpaid. Buy one game for your family and another for a school and the total price is just $14.00 postpaid (and $8.95 is tax deductible). Individuals or schools buying five or more games may take a whopping 50% discount—just $4.50 each. Customers outside of the U.S. must add $2.00 additional postage per game.

If you'd like an extra set of three binary dice for home or classroom, they are available for just $1.25 per set or five sets for $5.00.

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Trilingual Tutorial

Ray C. Horn Jr.

Below are definitions of several terms that appear in this article.

Source Code—Computer programs as written by most humans. Source code contains conveniences and shortcuts that the machine can't directly use. For example, rather than using the instruction JP $1000 (jump to location 1000 hex), the programmer can enter the line JP SUB1, and then label the line he wants to jump to with the label SUB1. An assembler or compiler program takes this code and turns it into straight machine language.

Object Code—The actual machine language that the computer uses. This is in the form of numbers which refer to instructions, memory locations, and just plain numbers.

Interpreted Language—Some computer languages are translated into machine code during execution. Each line is interpreted every time it occurs. Consider the Basic lines

```
10 FOR X = 1 TO 10
20 PRINT X
30 NEXT X
```

lines 20 and 30 would be translated into machine code ten times. The interpreter doesn't remember that it has interpreted a line before. This repetition is the major reason why interpreted languages execute slowly.

Compiled Language—Computer languages can be translated, as whole programs, into machine language. The compiled language performs the desired functions of the original program without any need to translate while running. This type of language runs considerably faster than an interpreted language. A program is written in source code, then compiled into object code.—D.L. □

Microcomputer programming is more than just Basic, Pascal or Fortran, or who's got what CPU, or how much RAM we own, or even how many megabytes of on-line disk storage we command. It is much more than this. It is, and necessarily should be, fun and enjoyable.

How many times have you heard someone say that Assembly Language or any other language is difficult to program? Sure, assembly is difficult because of the nature of what you are trying to accomplish, but should that preclude you from learning how to program assembly effectively? More importantly, should you be fearful or apprehensive about taking the plunge into Assembly Language just because you'll need to learn a couple of other numbering systems or just because you'll have to lower yourself to the level of the machine in order to tell the little beast what you want it to do without all the elegant Basic niceties you've come to know and rely on?

My answer is an absolute NO! Assembly Language programming should not cause anybody to be fearful or apprehensive. Fearful of what? The computer isn't going to byte anybody (pardon the pun), or get mad and walk away if you make a few mistakes. So what if the first couple of programs don't quite run properly? So what if you have to go back and rewrite a program to get rid of an elusive bug? It's all part of the total programming experience.

My objective in this article is to expose you to three different programming languages: Basic, Basex (a little known but very useful language) and Z-80 Assembly Language.

To illustrate the relative strengths and weaknesses of the three languages I will use a single problem and present its solution in each language. The problem at hand is "What to Name the Baby?," the inspiration for which came to me after reading Paul Raymer's article in the August 1980 issue of *Creative Computing*.

Ray C. Horn Jr., PSC Box 3303, Edwards AFB, CA 93523.

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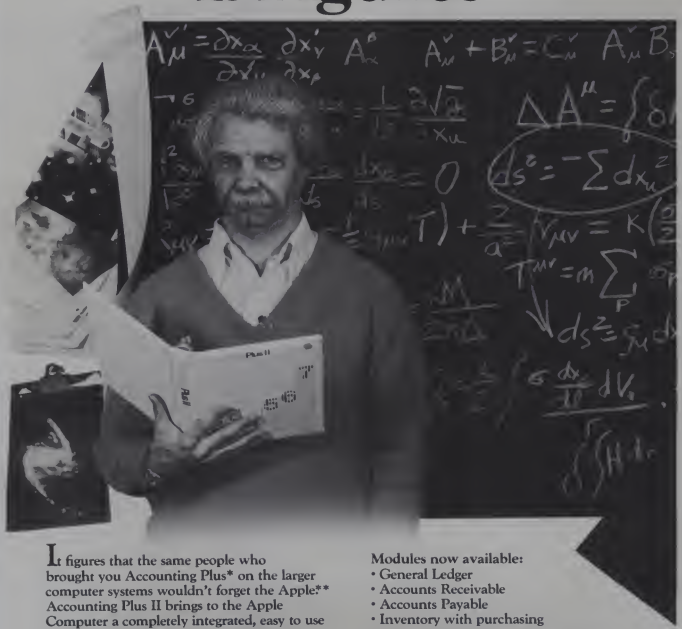

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Listing 1. (Basic Listing.)

```
100   CLEAR:DEFINT W-Z
110
120   * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
130   *                                                       *
140   *              FOUR LETTER WORDS . . . REVISTED         *
150   *                                                       *
160   *                        BY:  RAY C. HUNNICUTT          *
170   *                   COPYRIGHT (C) 19 AUGUST 1980        *
180   *                                                       *
190   * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
200
210   FOR Z=1 TO 26:FOR Y=1 TO 26:FOR X=1 TO 26:FOR W=1 TO 26
      :T=T+1
      :PRINT"  "CHR$(64+W)CHR$(64+X)CHR$(64+Y)CHR$(64+Z)"  ";
      :NEXT:NEXT:NEXT:NEXT:PRINT
220   PRINT"TOTAL WORDS = "T
      :END
```

Listing 2. (Basex Listing.)

```
33000   REM ! WHAT TO NAME THE BABY - BASEX !
33006   DIM CR$ 1
33014   STR CR$ 1 1=13
33026   SET T=0
33044   *** START
33060   FOR Z=65
33068   FOR Y=65
33056   FOR X=65
33064   FOR W=65
33072   INC T
33078   CHR 32
33086   CHR 32
33090   CHR Z
33096   CHR Y
33102   CHR X
33108   CHR W
33114   CHR 32
33120   CHR 32
33126   TIL W+1 90
33138   TIL X+1 90
33150   TIL Y+1 90
33162   TIL Z+1 90
33174   PRT CR$ 1
33182   PRT "TOTAL WORDS= T CR$ 1
33194   END
```

Simply stated, the problem is to generate and display all possible four-letter words using the entire alphabet from A-Z. Such as AAAA, AAAB, AAAC, etc. There are exactly 456,976 four-letter words possible. Not exactly a trivial problem after all.

The Basic Listing

The Level II Basic listing (Listing 1) is quite straightforward. Lines 210-220 do all the work necessary to produce a listing of all possible four-letter words. Unfortunately, interpretive Basic is quite slow. Listing 1 prints out approximately 22.4 four-letter words per second, and takes over five hours to complete the list. But then Basic isn't used because it's fast. Basic is easy to program and debug, and most of us get lazy every now and then and go back to Basic for recreational programming.

The Basex Listing

Basex stands for Basic and Executable machine code, which is exactly what it is: part Basic and part machine code mnemonics. Basex is a compiled, interactive, high level language, and what it lacks in structure it gains in processing speed. For this application Basex is about five times faster than Level II Basic. Basex (see Listing 2) runs to completion in about 1 hour, 7 minutes, 24.38 seconds, or about 113 four-letter words per second.

For those of you not really familiar with Basex syntax or structuring, I'll walk through Listing 2 and explain.

With Basex we don't use line numbers as with Basic, instead we use a memory address where the call to the runtime routine is located. Also we don't use multi-function lines as in Basic, instead we get one Basex statement for each statement address or program line.

Line 33000 is a regular REMark statement. Line 33006 is a regular DIMension statement familiar to most of us in conjunction with data arrays, except here we are setting aside string storage space at the string variable CR$. Line 33014 is a string storage statement which directs Basex to assign the ASCII code 13 to the first location of string CR$.

Basex is a compiled, interactive, high level language, and what it lacks in structure it gains in processing speed.

Line 33026 is similar to a Basic LET statement; in Basex SET does the same job as LET. Line 33034 is a program label; Basex will assign the value 33034 to the symbolic label START. Lines 33040-33064 do the same job as the first logical line of line 210 in Basic listing: setting up nested FOR...TIL loops. ASCII code 65 is the letter "A."

In line 33072 (since Basex is an integer subset language we can count only from 0 to 65535) variable T was supposed to count the total words printed. A small goof on my part—variable T does not actually reflect the total words printed.

Lines 33078-33120 will print two spaces, a four-letter word, and two more spaces continuously throughout the running of the program. This will cause eight words to be printed to a line on the video display, and this will also allow normal scrolling. Variables Z, Y, X and W are used to keep track of the four different letters we are using at any given time. The CHR statement in Basex causes an ASCII code to be printed to the video display, much like CHR$(x) statement in Basic.

Lines 33126-33162 close each of the open FOR...TIL loops established in lines 33040-33064. ASCII code 90 is the letter "Z."

Lines 33174-33194 print a carriage return to the screen and then tell us the value of T, not the actual number of words printed. The END statement in Basex is similar to END in Basic; it tells Basex where and when to stop and turn control back over to the Basex monitor program.

If you study listings 1 and 2 you should see quite a few similarities in both syntax and structure. This is because Basex and Basic are so very much alike that one could readily convert Basic syntax to Basex syntax. But that's where the similarities end, because Basex is compiled language, not an interpretive language like Basic; hence Basex will run about five times faster than interpretive Basic.

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Get in sync

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A Fascinating Computer

The ZX80 doesn't have memory mapped video. Thus the screen goes blank when a key is pressed. To some reviewers this is a disadvantage. To our editors this is a challenge. One suggested that games could be written to take advantage of the screen blanking. For example, how about a game where characters and graphic symbols move around the screen while it is blanked? The object would be to crack the secret code governing the movements. Voila! A new game like Mastermind or Black Box uniquely for the ZX80.

We made some interesting discoveries soon after setting up the machine. For instance, the CHR$ function is not limited to a value between 0 and 255, but cycles repeatedly through the code. CHR$ (9) and CHR$ (265) will produce identical values. In other words, CHR$ operates in a MOD 256 fashion. We found that the "=" sign can be used several times on a single line, allowing the logical evaluation of variables. In the Sinclair, LET X=Y=Z=W is a valid expression.

Or consider the TL$ function which strips a string of its initial character. At first, we wondered what practical value it had. Then someone suggested it would be perfect for removing the dollar sign from numerical inputs.

Breakthroughs? Hardly. But indicative of the hints and kinds you'll find in every issue of **SYNC**. We intend to take the Sinclair to its limits and then push beyond, finding new tricks and tips, new applications, new ways to do what couldn't be done before. **SYNC** functions on many levels, with tutorials for the beginner and concepts that will keep the pros coming back for more. We'll show you how to duplicate commands available in other Basics. And, perhaps, how to do things that can't be done on other machines.

Many computer applications require that data be sorted. But did you realize there are over ten fundamentally different sorting algorithms? Many people settle for a simple bubble sort perhaps because it's described in so many programming manuals or because they've seen it in another program. However, sort routines such as heapsort or Shell-Metzner are over 100 times as fast as a bubble sort and may actually use less memory. Sure, 1K of memory isn't a lot to work with, but it can be stretched much further by using innovative, clever coding. You'll find this type of help in **SYNC**.

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One of the most ancient forms of arithmetical puzzle is called a "boomerang." The oldest recorded example is that set down by Nicomachus in his *Arithmetica* around 100 A.D. You'll find a computer version of this puzzle in **SYNC**.

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Tutorial, continued...

Assembly Listing

Listing 3 represents a quantum leap in data throughput for this particular problem. It will run to completion in just about 32 minutes 42 seconds, or about 232.8 four-letter words per second on the video. For this particular example, Assembly Language will run just about 10 times faster than Basic and about 2.5 times faster than Basex. Obviously if you were going to run a program such as I have presented in this article, you would not want to wait five hours for the program to finish; even one hour is a long time when you just want to see the program run to completion. With the aid of Assembly Language, it is possible to attain fantastic output rates with only minimal effort.

Contrary to popular belief, Assembly Language is not difficult to program. In fact, once you see just how easy it is to get successful results you'll probably never go back to Basic except for light recreational programming.

With the aid of Assembly Language, it is possible to attain fantastic output rates with only minimal effort.

For those who are not familiar with Assembly Language I'll go through the source code line by line:

Line 200 may be changed to suit your individual needs; I'm running 48K RAM so I always put the object code well above the source code for my assembler. Line 210, CALL 01C9H, calls a subroutine from the Basic ROMs to clear the screen and put the cursor in the upper left corner. Lines 220-240 initialize the four counters we will be using to contain 01's. Lines 250-280 initialize the six-digit BCD (binary coded decimal) total words printed counter that we'll be using later.

Lines 290-430 form a function similar to 'T=T+1' using single precision variables in Basic. Here we are using a six digit BCD counter.

Line 440-460 get two spaces (ASCII code 20 hex or 32 decimal) and puts them at the beginning and the end of the output string buffer, similar to the two CHR 13's at the front and back of the four letter output segment in the Basex program (see lines 33078-33120).

Lines 470-530 do the same job as, CHR$(64+W)CHR$(64+X)CHR$(64+Y)CHR$(64+Z) in Basic.

Listing 3. (Assembly Listing.)

```
                        100   ; WHAT TO NAME THE BABY? REVISITED.
                        110   ;  ADAPTED FROM APPLESOFT LISTING.
                        120   ;  CREATIVE COMPUTING, AUGUST 1980, PG. 98
                        130   ;
                        140   ; ASSEMBLY PROGRAM : WORD4 VERSION 2.3
                        150   ;     BY:  RAY C. HORN JR.
                        160   ; COPYRIGHT (C). LB AUGUST 1980
                        170   ;
                        180   ;
                        190   ;
A000                    200           ORG 0A000H      ; MID 32K
A000  CD C9 01          210   START   CALL 01C9H      ; CLEAR SCREEN
A003  21 01 01          220           LD HL,0101H     ; GET 1 TO
A006  22 D1 A0          230           LD (W),HL       ; INIT X  W
A009  22 D3 A0          240           LD (Y),HL       ; INIT. Z  Y
A00C  21 00 00          250           LD HL,0000H     ; GET A 0 TO
A00F  22 D5 A0          260           LD (T),HL       ; INIT. BCD COUNTER
A012  AF                270           XOR A           ; ZAP ACC.
                        280
A013  32 D7 A0          290           LD (T+2),A      ; INIT. ALL OF BCD CNTR.
A016  21 D7 A0          300   MNLOOP  LD HL,T+2       ; PNT TO BYTE #0
A019  7E                310           LD A,(HL)       ; GET BYTE NO OF BCD CNTR
A01A  C6 01             320           ADD A,1         ; BUMP BYTE 0
A01C  27                330           DAA             ; DECIMAL ADJUST BYTE 0
A01D  77                340           LD (HL),A       ; PUT BYTE 0 BACK
A01E  2B                350           DEC HL          ; PNT TO BYTE 1
A01F  7E                360           LD A,(HL)       ; GET BYTE 1
A020  CE 00             370           ADC A,0         ; BUMP BYTE 1 (ADD CY)
A022  27                380           DAA             ; DECIMAL ADJUST BYTE 1
A023  77                390           LD (HL),A       ; PUT BYTE 1 BACK
A024  2B                400           DEC HL          ; PNT TO BYTE 2
A025  7E                410           LD A,(HL)       ; GET BYTE 2
A026  CE 00             420           ADC A,0         ; BUMP BYTE 2 (ADD CY)
A028  27                430           DAA             ; DECIMAL ADJUST BYTE 2
A029  77                440           LD (HL),A       ; PUT BYTE 2 BACK
                        450   ; LINES 290 - 430 ARE SAME AS
                        460   ;  BASIC T=T+1  (SINGLE PRECISION)
                        470   ; ONLY MUCH FASTER.
                        480   ;
A02A  21 20 20          490           LD HL,2020H     ; GET SPACES
A02D  22 D8 A0          500           LD (WORD),HL    ; PAD 2 SPACES IN FRONT
A030  22 DE A0          510           LD (WORD+6),HL  ; PAD 2 SPACES IN REAR
                        520   ;
A033  01 40 40          530           LD BC,4040H     ; GET ( A -1)
A036  2A D1 A0          540           LD HL,(W)       ; GET W  X CNTRS.
A039  09                550           ADD HL,BC       ; COMPUTE (W+40H),(X+40H)
A03A  22 DA A0          560           LD (WORD+2),HL  ; STORE 1ST TWO LETTERS
A03D  2A D3 A0          570           LD HL,(Y)       ; GET Y  Z1 CNTRS.
A040  09                580           ADD HL,BC       ; COMPUTE (Y+40H),(Z1+40H
A041  22 DC A0          590           LD (WORD+4),HL  ; STORE LAST TWO LETTERS
A044  21 D8 A0          600           LD HL,WORD      ; PNT TO WORD
A047  06 08             610           LD B,8          ; 8 CHARS TO SEND
A049  7E                620   PLOOP   LD A,(HL)       ; GET CHAR
A04A  CD 33 00          630           CALL 0033H      ; SEND IT TO VIDEO
A04D  23                640           INC HL          ; BUMP PNTR
                        650   ;
A04E  10 F9             660           DJNZ PLOOP      ; DO 8 TIMES
                        670   ;
A050  3A B0 38          680   BREAK   LD A,(38B0H)    ; CHECK SHIFT?
A053  CB 47             690           BIT 0,A         ; SHIFT?
A055  28 09             700           JR Z,NEXTZ      ; IF NOT SHIFT, DO NEXT
A057  3A 40 38          710           LD A,(3840H)    ; BREAK CHECK
A05A  CB 57             720           BIT 2,A         ; BREAK?
A05C  28 02             730           JR Z,NEXTZ      ; IF NOT BREAK, DO NEXT
A05E  18 48             740           JR TOTALW       ; ELSE IF SHIFT-BREAK, EN
                        750   ;
A060  3A B4 A0          760   NEXTZ   LD A,(Z1)       ; GET Z1 CNTR
A063  3C                770           INC A           ; BUMP Z1
A064  32 D4 A0          780           LD (Z1),A       ; PUT BUMPED Z1 BACK
A067  FE 18             790           CP 27           ; Z1 = 1 + 26 ?
A069  FA 78 A0          800           JP M,NEXTY      ; IF Z1 < 27
A06C  3A D3 A0          810           LD A,(Y)        ; ELSE GET Y CNTR
A06F  3C                820           INC A           ; BUMP Y
A070  32 D3 A0          830           LD (Y),A        ; PUT BUMPED Y BACK
                        840   ;
A073  3E 01             850           LD A,1          ; GET 1
A075  32 D4 A0          860           LD (Z1),A       ; INIT Z1 COUNTER
A078  3A D3 A0          870   NEXTY   LD A,(Y)        ; GET Y CNTR
A07B  FE 18             880           CP 27           ; Y = 1 + 26 ?
A07D  FA 8C A0          890           JP M,NEXTX      ; IF Y < 27
A080  3A D2 A0          900           LD A,(X)        ; ELSE, GET X CNTR
A083  3C                910           INC A           ; BUMP X
A084  32 D2 A0          920           LD (X),A        ; PUT BUMPED X BACK
A087  3E 01             930           LD A,1          ; GET 1
A089  32 D3 A0          940           LD (Y),A        ; INIT Y CNTR
A08C  3A D2 A0          950   NEXTX   LD A,(X)        ; GET X CNTR
A08F  FE 1B             960           CP 27           ; X = 1 + 26 ?
A091  FA A0 A0          970           JP M,NEXTW      ; IF X  27
A094  3A D1 A0          980           LD A,(W)        ; GET W CNTR
```

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Tutorial, continued...

Lines 540-590 do the same job as 'PRINT" "CHR$(64+W)CHR$(64+X) CHR$(64+Y)CHR$(64+Z)" ";" in Basic. In other words it prints eight characters, with the four inner characters being the four letter word we generated in lines 470-530.

Lines 600-660 strobes the keyboard for the Shift and Break keys to be pressed. If Shift-Break keys are pressed simultaneously, the program will print the total words printed up until that point and then it stops at the SYSTEM entry command prompt. We have to have some way of stopping the program in an orderly manner outside of pressing the RESET button.

Lines 670-960 do the same job as 'NEXT Z:NEXT Y:NEXT X:NEXT W:' in Basic only much faster.

Lines 970-1090 are where our program ends up after 32 minutes of strenuous activity. It will print a CR/LF (carriage return and line feed), then it will print a message for the operator, and then it will convert and print the total number of words generated from the six digit BCD counter. Then the program will wait for a few seconds for the operator to take his finger off the Break key, otherwise you'd fall back into Basic 'READY' without getting a change to restart the program from the SYSTEM entry prompt ('*?_').

Lines 1096-1180 define variable names, store our messages and create a word buffer.

Lines 1190-1310 are a very simple BCD to ASCII conversion routine taken from a Z-80 handbook I had laying around at home. We need some way of converting BCD to ASCII to be easily understood.

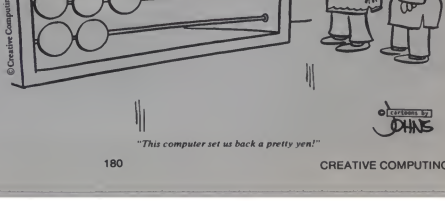
Line 1320 is a standard assembler END statement; it causes START to be considered as the auto-start address upon assembly.

```
A097  3C          890            INC A          ; BUMP W
A098  32 D1 A0    900            LD (W),A       ; PUT BUMPED W BACK
A09B  3E 01       910            LD A,1         ; GET 1
A09D  32 D2 A0    920            LD (X),A       ; INIT X TO 1
A0A0  3A D1 A0    930  NEXTW     LD A,(W)       ; GET W CNTR
A0A3  FE 1B       940            CP 27          ; W = 1 <= W <= 26?
A0A5  F2 AB A0    950            JP P,TOTALW    ; IF W >= 26
A0A8  C3 16 A0    960            JP MNLOOP      ; IF W >= 27
                  962  ;
A0AB  3E 0D       970  TOTALW    LD A,13        ; GET CR/LF
A0AD  CD 33 00    980            CALL 0033H     ; SEND IT TO VIDEO
A0B0  21 E1 A0    990            LD HL,TOTWRD   ; PNT TO MESSAGE
A0B3  CD A7 B0    1000           CALL PRNTH     ; TELL OPERATOR
A0B6  3A D5 A0    1010           LD A,(T+0)     ; GET BYTE #2 BCD CNTR.
A0B9  CD F1 A0    1020           CALL BXBCD     ; CONVERT  PRINT ASCII
A0BC  3A D6 A0    1030           LD A,(T+1)     ; GET BYTE #1 BCD CNTR.
A0BF  CD F1 A0    1040           CALL BXBCD     ; CONVERT  PRINT ASCII
A0C2  3A D7 A0    1050           LD A,(T+2)     ; GET BYTE #0 BCD CNTR
A0C5  CD F1 A0    1060           CALL BXBCD     ; CONVERT  PRINT ASCII
A0C8  01 FF FF    1070           LD BC,0FFFFH   ; SET DELAY COUNT
A0CB  CD 60 00    1080           CALL 0060H     ; DELAY HERE FOR A WHILE
A0CE  C3 B2 02    1090           JP 02B2H       ; BACK TO BASIC(SYSTEM *:
                  1092 ;
                  1094 ;
                  1096 ; SYSTEM VARIABLES:
A0D1  01          1100 W         DEFB 1         ;
A0D2  01          1110 X         DEFB 1         ;
A0D3  01          1120 Y         DEFB 1         ; N = 1 <= N <= 26
A0D4  01          1130 Z1        DEFB 1         ;
A0D5              1140 T         DEFS 3         ; REAL 6 DIGIT BCD CNTR.
A0DB              1150 WORD      DEFS 8         ; WORD BUFFER
A0E0  00          1160           DEFB 00H       ; DELIMITER
A0E1  20 54 4F    1170 TOTWRD    DEFM ' TOTAL WORDS = '
A0E4  54 41 4C
A0E7  57 4F 52
A0EB  53 20 3A
A0EF  20 00
                  1180           DEFB 00H       ; DELIMITER
                  1182 ;
                  1184 ; END SYSTEM VARIABLES.
A0F1  4F          1190 BXBCD     LD C,A         ; SAVE BCD BYTE IN C
A0F2  E6 F0       1200           AND 0F0H       ; MASK OFF LOW DIGIT
A0F4  0F          1210           RRCA           ;
A0F5  0F          1220           RRCA           ;
A0F6  0F          1230           RRCA           ; ALIGN HI-DIGIT TO LOW
A0F7  0F          1240           RRCA           ;
A0F8  C6 30       1250           ADD A,30H      ; MAKE ASCII (30H-39H)
A0FA  CD 33 00    1260           CALL 0033H     ; PRINT DIGIT ON SCREEN
A0FD  79          1270           LD A,C         ; GET BCD BYTE BACK FROM C
A0FE  E6 0F       1280           AND 0FH        ; MASK OFF HI DIGIT
A100  C6 30       1290           ADD A,30H      ; MAKE ASCII (30H-39H)
A102  CD 33 00    1300           CALL 0033H     ; PRINT DIGIT ON SCREEN
A105  C9          1310           RET            ; RETURN TO CALLER
                  1312 ;
A000              1320           END START      ; AUTO-START HERE
```

Conclusion

That's really all there is to programming Basic. Basex and Assembly Language for a fairly simple problem.

In general, once you've determined how to go about solving a given problem in Basic, it's really a very easy task to rewrite the program for almost any other language whether it be Basex, Pascal, Fortran, Forth, or Assembler. The logic of the thing stays the same no matter which language you choose to express the problem. With this general concept in mind, programming can become quite enjoyable and even fun. I thoroughly enjoy programming Assembly Language because of the challenge it presents and also because of the raw programming power that Assembly allows me to use. In Assembly Language you have total control over what the CPU does and how it does it. Not many languages afford you that much control. □



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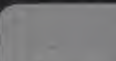

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0000-0002	0005-000D	0010-0046	0049-004F	0063-0065
0071-0081	0083-00A9	00AB-00AD	00AF-00B1	00B5-00C5
00C7-00E9	00EB-00FE	0102-0105	010B-010C	0110-0111
0116-0117	011C-011C	0122-0124	012D-01D9	01F0-01F0
01F2-01F2	01F5-01F7	0210-0211	0232-0234	0246-0246
025F-0263	0283-0283	02A8-02E1	02E5-03C1	03EA-03EA
0469-046A	0495-0495	049F-049F	04B8-04B8	050D-050D
0533-0533	05D0-05D0	05D4-0673	0708-124B	124E-1917
1919-191B	191D-1B5C	1B60-206C	206E-2072	2074-2074
2076-2076	20B9-20BB	20BD-20F6	20F8-213A	213C-2166
2168-2269	226F-2B84	2B89-2B8B	2B8F-2B90	2B94-2C1E
2C43-2C79	2C80-2C80	2C83-2C89	2C8D-2FFB	—

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Table 1. Model I and Model III ROM comparison (start address-end address).

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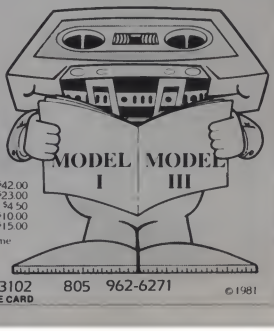

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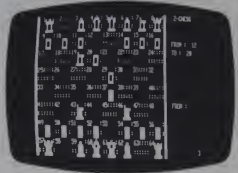

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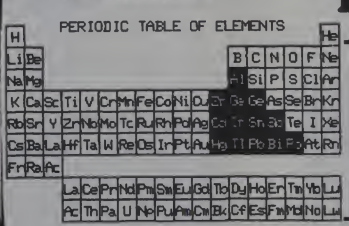
PERIODIC TABLE



Dean Schmidt

Periodic Table is a program which produces a Periodic Table on the screen with each element symbol in its correct place. Three options are given. The first allows the user to select a group of elements, for example, the transition elements, which are shown in inverse on the periodic table. There are eleven different groups that can be selected.

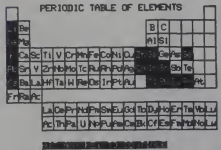
Another option starts with the temperature in the upper left hand starting at absolute zero. As the temperature rises, each element changes to inverse on the screen as it reaches its melting point. When an element reaches its vaporization point its symbol is removed from the periodic table.

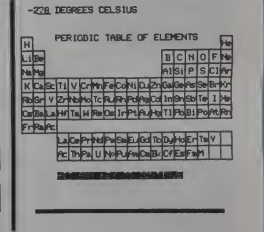
The third option is a variation of the second. The user may select a specific temperature and have the conditions shown for that temperature. For example, if 0° Celcius were chosen, each element that is a solid at that temperature is shown on the screen in normal characters. Each element that is a liquid is shown in inverse, and each element that is a gas is eliminated from the table.

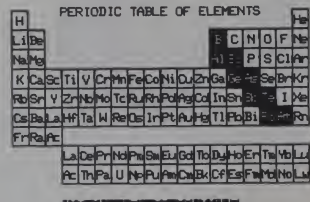
The program is written in Pascal for the Apple II Plus with language card.

Sample runs of Periodic Table are shown here. If you would like a listing of the program, please send $1.00 with an SASE to: Magic City Campus, Minot H.S., Minot, ND 58701, Attn: Computer Club. For a disk containing the program, send $10 or $5 and a blank disk to the same address. □

Dean Schmidt, #1 Southwest 22nd St., Minot, ND 58701.







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CIRCLE 205 ON READER SERVICE CARD

A Basic Generative Grammar Program

Kimball M. Rudeen

The article "Grammar as a Programming Language" (Jan/Feb 1978) contained examples of how to use the REPLACE command in Logo to generate sentences from syntactical rules. The following article shows how a similar approach can be done in Basic on the TRS-80.

This program was inspired by the article "Grammar as a Programming Language" in the Jan/Feb 1978 issue of *Creative Computing*. Since I had studied formal grammars in college, the idea of a program able to generate statements according to a given grammar was familiar and fascinating. I decided to write my own as soon as I had my own computer. The program described in this article is, I think, a decent attempt. It has all the necessary basic capabilities, plus a few frills which I found convenient.

The program, written in Basic for the TRS-80, is separated into five modes—Grammar, Generate, Edit, Read and Write. The capacities and operation of these modes are described in the following sections.

Grammar Mode

Grammar mode is used to input the rules of the chosen grammar. Rules are of the form

STRING = SUB1/SUB2/SUB3.../SUBN

where STRING is the string of characters to be replaced, and SUB1...SUBN are the possible replacement strings, separated in the rule by the "/" character. Recursion is allowed, and replacement strings may of course, be the initial strings of other rules. "Null" replacement strings, which replace an initial string with zero characters, are indicated by a double slash "//." Every time the Grammar or Read modes are entered, all previously defined rules are lost. An existing grammar may be modified by the edit commands (see Edit mode). Rules may be input by the user or read from tape, rules may be saved on tape (see Read/Write Mode). Figure 1 illustrates grammar input.

Figure 1.

```
MODE - GRAMMAR, GENERATE, EDIT, READ, WRITE, TERMINATE:
GRAMMAR
INPUT RULE - USE END TO HALT:
SEN=SUB VER OBJ
SUB=ARTICLE NOUN/NAME
VER=LIKES/HATES/SEES/RUNS AFTER
OBJ=ARTICLE NOUN
NAME=BILL/TOM/HARRY/JOE
END
```

Figure 2.

```
MODE - GRAMMAR, GENERATE, EDIT, READ, WRITE, TERMINATE:
GENERATE
INPUT START SYMBOL LIST - USE PERIOD TO END LIST AND END TO EXIT
GENERATE MODE.
1 SEN AND SEN
2 SEN
.
1 SUB VER OBJ AND SUB VER OBJ
1 NAME VER OBJ AND NAME VER OBJ
1 NAME SEES OBJ AND NAME RUNS AFTER OBJ
1 NAME SEES ARTICLE NOUN AND NAME RUNS AFTER ARTICLE NOUN
1 JOE SEES ARTICLE NOUN AND HARRY RUNS AFTER ARTICLE NOUN
2 SUB VER OBJ
2 ARTICLE NOUN VER OBJ
2 ARTICLE NOUN HATES OBJ
2 ARTICLE NOUN HATES ARTICLE NOUN
1 JOE SEES ARTICLE NOUN AND HARRY RUNS AFTER ARTICLE NOUN
2 ARTICLE NOUN HATES ARTICLE NOUN
FINISH
INPUT START SYMBOL LIST - USE PERIOD TO END LIST AND END TO EXIT
GENERATE MODE.
END
```

Generate Mode

Generate mode is used to input the list of strings to which the program will apply the grammar defined in the grammar mode. Each entry string may contain substrings not defined as an initial string in any grammar rule. Such substrings will not be changed by the program.

Each entry string will be treated separately. The program will continue to try the rules of the defined grammar against a given string, printing out intermediate results, until no more replacements can be made. If no grammar rule applies to a list entry, it will be left unchanged.

At the end of the process, the final result for each list entry will be printed out. The output subroutine is designed to avoid ending a line in the middle of a substring when possible. When this occurs, the subroutine will backtrack to a blank in the current string and end the line there. If no blank exists, the string will be printed as is. Note: a recursive grammar rule can generate an infinite loop. Figure 2 illustrates the operation of the Generate mode.

Kimball Rudeen, 57 Taft Ave., Lexington, MA 02173.

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```
MODE - GRAMMAR, GENERATE, EDIT, READ, WRITE, TERMINATE:
EDIT
EDIT - LIST, ADD, DELETE, MODIFY, QUIT:
EDIT:LIST
  1                3/SEN/ 1/SUB VER OBJ/
  2                3/SUB/ 2/ARTICLE NOUN/NAME/
  3                3/VER/ 4/LIKES/HATES/SEES/RUNS AFTER/
  4                3/OBJ/ 1/ARTICLE NOUN/
  5                4/NAME/ 4/BILL/TOM/HARRY/JOE/
EDIT:DELETE
NAME
EDIT:MODIFY
SUB=ARTICLE ADJECTIVE NOUN
EDIT:ADD
ARTICLE=A/THE
EDIT:ADD
NOUN=CAT/DOG/BIRD/HORSE
EDIT:LIST
  1                3/SEN/ 1/SUB VER OBJ/
  2                3/SUB/ 1/ARTICLE ADJECTIVE NOUN/
  3                3/VER/ 4/LIKES/HATES/SEES/RUNS AFTER/
  4                3/OBJ/ 1/ARTICLE NOUN/
  5                7/ARTICLE/ 2/A/THE/
  6                4/NOUN/ 4/CAT/DOG/BIRD/HORSE/
EDIT:QUIT
```

Figure 3.

Edit Mode

Edit mode is used to modify an existing grammar. There are four commands: List, Add, Delete, and Modify. The List command will list the current grammar rules in their storage format. This consists of the original Grammar mode input format, plus two count values giving the length in characters of the initial string and the number of possible replacement strings.

The Add and Modify commands allow new rules to be changed. The Modify command requires the modified rule to be specified completely. The Delete string needs to be given. Figures 3 and 4 illustrate the operation of the Edit mode.

Read/Write Modes

Read/write modes are used to input or store in a grammar. I/O facilities may have to be provided by the user. The subroutines shown are designed for my machine, a TRS-80. These modes will save the trouble of redefining a complex grammar.

Applications

Applications of this program are many and varied. The examples given suggest demonstrating the rules of English grammar. The same rules defined "in reverse" would analyze a given sentence into its component parts. This program can be used to generate or analyze bars of music, statements in languages such as Pascal, graphic commands, or speech synthesizer commands—almost anything defined by a grammar.

Extensions

There is, of course, plenty of room for improvement. In the current program, the length of a generated string is limited to the length of a single string variable. It should be possible to generate into a string array rather than a single variable. Another possibility is special command characters to control output, such as a "#" character causing a skip to a new line. Additional features will suggest themselves with experience. □

Figure 4.

```
MODE - GRAMMAR, GENERATE, EDIT, READ, WRITE, TERMINATE:
GENERATE
INPUT START SYMBOL LIST - USE PERIOD TO END LIST AND END TO EXIT
GENERATE MODE.
SEN
.
SUB VER OBJ
ARTICLE ADJECTIVE NOUN VER OBJ
ARTICLE ADJECTIVE NOUN HATES OBJ
ARTICLE ADJECTIVE NOUN HATES ARTICLE NOUN
A ADJECTIVE NOUN HATES A NOUN
A ADJECTIVE BIRD HATES A BIRD
A ADJECTIVE BIRD HATES A BIRD
FINISH
INPUT START SYMBOL LIST - USE PERIOD TO END LIST AND END TO EXIT
GENERATE MODE.
END
MODE - GRAMMAR, GENERATE, EDIT, READ, WRITE, TERMINATE:
TERMINATE
```

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CIRCLE 155 ON READER SERVICE CARD

Generate Program Listing

```
 10 REM    GENERATE! A GENERATIVE GRAMMAR PROGRAM
 20 REM            BY KIMBALL M. RUDEEN
 30 CLS
 40 CLEAR 3000
 50 RANDOM
 60 DEFINT A-Z
 70 DIM COM$(50), ND$(25)
 75 REM  SELECT OPERATING MODE
 80 PRINT "MODE - GRAMMAR, GENERATE, EDIT, READ,
    WRITE, TERMINATE    :"
 90 INPUT M$:IF LEFT$(M$,3)="TER" END
100 IF LEFT$(M$,3)="GRA" GOTO 160
110 IF LEFT$(M$,3)="EDI" GOTO 2000
120 IF LEFT$(M$,3)="GEN" GOTO 220
130 IF LEFT$(M$,3)="REA" GOTO 4000
140 IF LEFT$(M$,3)="WRI" GOTO 5000
150 GOTO 80
155 REM  ORAMMAR RULE INPUT
160 CC=0
170 PRINT "INPUT RULE - USE END TO HALT:"
180 INPUT CC$
190 IF CC$="END" OOTO 80
200 OOSUB 1000
210 OOTO 180
215 REM  STRING GENERATION: INPUT START SYMBOLS
220 PRINT "INPUT START SYMBOL LIST - USE PERIOD
    TO END LIST AND END TO EXITGENERATE MODE."
230 CSD=0
240 INPUT ISD$
250 IF ISD$="." GOTO 280
260 IF ISD$="END" GOTO 80
265 REM  STRING GENERATION: SCAN STRINGS
270 CSD=CSD+1:ND$(CSD)=ISD$:GOTO 240
280 CD=0
290 CD=CD+1:IF CD)CSD GOTO 820
300 SD$=ND$(CD):CF=0:CL=0
310 CF=CF+1:CN=0
320 IF CF)CC GOTO 810
330 LN=VAL(COM$(CF))
340 M=4
350 IF LN)9 M=M+1
360 SUB$=MID$(COM$(CF),M,LN)
370 PS=0
380 LSD=LEN(SD$)
390 PS=PS+1
400 IF PS)LSD-LN+1 GOSUB 690:GOTO 310
410 NN=LN+PS-1
420 IF BUB$=MID$(SD$,PS,LN) OOTO 440
430 GOTO 390
435 REM  REPLACE STRINGS
440 LC=LEN(COM$(CF)):CL=1
450 M=LC-LN-4:IF LN)9 M=M-1
460 CN=VAL(RIGHT$(COM$(CF),M))
470 CM=INT(CN*RND(0))+1
480 PSD$=LEFT$(SD$,PS-1)
490 L1=LN+7
500 IF LN)9 L1=L1+1
510 IF CN)9 L1=L1+1
520 SN=0
530 FOR I=L1 TO LC
540 IF MID$(COM$(CF),I,1)="/" SN=SN+1
550 IF SN=CM GOTO 580
560 NEXT I
570 PRINT "ERRUR":CM,SN:GOTO 820
580 FI=I+1:I6M=0
590 FOR I=FI TO LC
600 CH$=MID$(COM$(CF),I,1)
610 IF CH$="/" GOTO 650
620 PSD$=PSD$+CH$
630 SM=SM+1
640 NEXT I
650 IF SM=0 NN=NN+1
660 I=LSD-NN
670 IF I)0 PSD$=PSD$+RIGHT$(SD$,I)
680 SD$=PSD$+ND$(CD)+SD$:PS=PS+SM-1:GOTO 380
685 REM  OUTPUT OENERATED STRINOB
690 IF CN=0 GOTO 800
700 LSD=LEN(SD$):M=1
710 LD=63
720 IF L5D-M+1)63 OOTO 750
730 PRINT MID$(SD$,M,L5D-M+1)
740 OOTO 800
750 FOR I=1 TO 63
760 IF MID$(SD$,M+LD,1)()" " LD=LD-1:NEXT I
770 IF LD()0 PRINT MID$(SD$,M,LD) ELSE PRINT
    MID$(SD$,M,63)
780 IF LD()0 M=M+LD+1 ELSE M=M+63
790 GOTO 710
800 RETURN
805 REM  CONTINUE GENERATION OR TERMINATE
810 IF CL()0 OOTO 300 ELSE GOTO 290
820 PRINT:CN=1
830 FOR CD=1 TO CSD
840 SD$=ND$(CD):GOSUB 690
850 NEXT CD
860 PRINT "FINIBH":GOTO 220
870 END
895 REM  REPLACE RULE CF IN LIST
900 BC=CC
910 CC=CF-1
920 OOSUB 1000
930 CC=BC
940 RETURN
995 REM  ADD GRAMMAR RULE TO LIST
1000 CC=CC+1:CE=1:CA=0
1010 FOR I=1 TO LEN(CC$)
1020 IF MID$(CC$,I,1)="/" CE=CE+1
1030 IF MID$(CC$,I,1)="=" CA=I
1040 NEXT I
1050 COM$(CC)=STR$(CA-1)+"/"+LEFT$(CC$,CA-1)
1060 COM$(CC)=COM$(CC)+"/"+STR$(CE)+"/"
1070 COM$(CC)=COM$(CC)+RIGHT$(CC$,LEN(CC$)-CA)+"/"
1080 RETURN
2000 PRINT "EDIT - LIST, ADD, DELETE, MODIFY, QUIT:"
2005 REM  EDIT ORAMMAR RULE8
2010 INPUT "EDIT:"!E$
2020 IF E$="LIST" GOTO 2080
2030 IF E$="ADD" OOTO 2100
2040 IF LEFT$(E$,3)="DEL" GOTO 2130
2050 IF LEFT$(E$,3)="MOD" GOTO 2220
2060 IF E$="QUIT" OOTO 80
2070 OOTO 2010
2080 FOR I=1 TO CC:PRINT I,COM$(I):NEXT I
2090 GOTO 2010
2100 INPUT CC$
2110 GOSUB 1000
2120 OOTO 2010
2130 INPUT BUB$
2140 LN=LEN(SUB$)
2150 OOSUB 3000
2160 IF CF=0 PRINT "NOT FOUND":GOTO 2010
2170 FOR I=CF+1 TO CC
2180 COM$(I-1)=COM$(I)
2190 NEXT I
2200 CC=CC-1
2210 OOTO 2010
2220 INPUT CC$
2230 LN=0
2240 FOR I=1 TO LEN(CC$)
2250 IF MID$(CC$,I,1)()"=" LN=LN+1:NEXT I
2260 SUB$=LEFT$(CC$,LN)
2270 GOSUB 3000
2280 IF CF=0 PRINT "NOT FOUND":OOTO 2010
2290 GOSUB 900
2300 OOTO 2010
2995 REM  LOCATE ORAMMAR RULE
3000 FOR CF=1 TO CC
3010 IF LN()VAL(COM$(CF)) OOTO 3040
3020 M=4:IF LN)9 M=M+1
3030 IF SUB$=MID$(COM$(CF),M,LN) OOTO 3060
3040 NEXT CF
3050 CF=0
3060 RETURN
3995 REM  INPUT GRAMMAR RULES
4000 CC=0
4010 INPUT#-1,CC$
4020 IF CC$="END" GOTO 80
4030 CC=CC+1:COM$(CC)=" "+CC$:OOTO 4010
4995 REM  WRITE GRAMMAR RULES
5000 FOR CF=1 TO CC:PRINT#-1,COM$(CF):NEXT
5010 PRINT#-1,"END":GOTO 80
```

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By Eileen Shapiro

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By Myrna Helfand

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CIRCLE 156 ON READER SERVICE CARD

Henri Picciotto

PET Screen Line Length

Notes on Overcoming Some Strange Problems on the PET

The fact that on the PET screen a line has 40 characters, while a logical line can have up to 80 (actually 79), leads to some tricky situations.

When you press the RETURN key, the PET enters your input into memory. This applies to entering direct mode commands, Basic program lines, or inputs during a program RUN. Your input is picked up off the screen, not directly from the keyboard as on many other computers. (Actually the screen buffer in memory—Ed.) This has many advantages: for instance, it allows you to enter a modifed version of a Basic program line without having to retype the whole line. However, to do this properly, The PET must know whether it is expected to pick up input off a 39- or a 79- character line. The length of the current line (39 or 79) is stored at memory location 213 (242 in the old ROMs). The program entitled Experiment 1 will allow you to check this out for yourself, by entering various values for M. The PET also needs to know where the line in questions begins. This information is kept at memory locations 196-197 (224-225 on the old ROMs).

When the cursor is on a given line on the screen, the PET generally assumes that it is a 39-character line. However, if a character has been printed in the 40th position of the same screen line, the PET will assume that the cursor is in the first half of a 79-character line. If a character has been printed in the 40th position of the preceding screen line, the PET assumes that the cursor is in the second half of a 79-character line. (There is one exception. "Printing" a cursor movement through the 40th position of a screen line does not affect the length of the logical line. To verify this, put a "cursor right" instead of a graphic character on line 120 of Experiment 1.) This feature usually works to the user's advantage by allowing him to enter Basic program lines or INPUTs of up to 79 characters automatically. However, there are situations where this arrangement causes problems.

One such situation is when a program prints a carriage return while the cursor is in the first half of a 79-character line. What happens then is that the cursor is sent to the beginning of the next logical line, which is one screen line below the location expected by the user. For example, try writing a program that will draw a box, 40 characters wide and 12 characters high, and then number the 10 lines in the box, producing the result shown in Figure 5. Of course, there are several ways to do this. (Feel free to find your own before reading on.) Program 1 shows one way to draw the box using PRINT statements. However the program runs into trouble when trying to number the lines (see Figure 1). The 1 is in the second half of a 79-character line, so the carriage return, generated by the lack of a semi-colon after the 'Z' in line 180, works normally. But the numbers 2 through 6 are in the first halves of 79-character lines, and the carriage return skips a screen line

```
100 REM    EXPERIMENT  1
110 INPUT M
120 FOR Z=1 TO M : PRINT "*";  : NEXT
130 PRINT PEEK(213)
140 RUN
```

Experiment 1.

```
READY
```

Figure 5. Program 1B, 1C or 1D output.

```
100 REM   PROGRAM  1
110 PRINT "{CLR}";
120 FOR Z=1 TO 40 : PRINT "*"; : NEXT
130 FOR Z=1 TO 10
140 : PRINT "{DOWN}{RVS}*";
150 NEXT
160 FOR Z=1 TO 40 : PRINT "*"; : NEXT
170 PRINT "{5 DOWN}";
180 FOR Z=1 TO 10 : PRINT "{LEFT}" Z : NEXT
```

Program 1.

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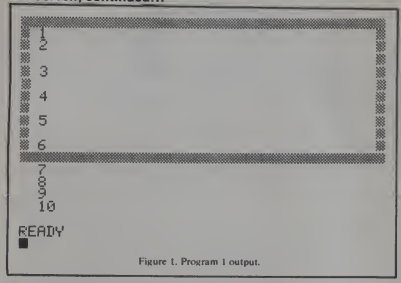

Figure 1. Program 1 output.

every time. Outside the box, the lines are 39-character lines, so that the carriage return functions as expected.

Another problem arises in the use of the TAB function, which counts the columns starting at the beginning of the logical line. This can be quite confusing if the cursor is in the second half of a 79-character line and the program prints a TAB(5), for example. Much to the user's surprise, nothing happens! The reason is that the cursor is already beyond the 40th column, and one cannot TAB backwards.

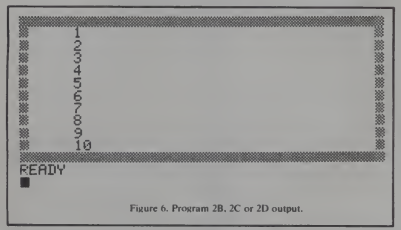

Figure 6. Program 2B, 2C or 2D output.

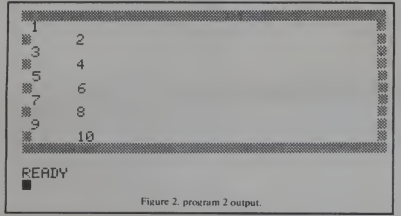

Figure 2. program 2 output.

```
100 REM  PROGRAM 1A
110 PRINT "J";
120 FOR Z=1 TO 39 : PRINT "■";   NEXT
130 PRINT
140 FOR Z=1 TO 10
150 : PRINT "■" SPC(37) "■"
160 NEXT
170 FOR Z=1 TO 39 : PRINT "■";   NEXT
180 PRINT "■";
190 FOR Z=1 TO 10 : PRINT "■" Z : NEXT
```

Program 1A.

```
100 REM  PROGRAM 2
110 PRINT "J";
120 FOR Z=1 TO 40 : PRINT "■";   NEXT
130 FOR Z=1 TO 10
140 : PRINT "■■■■■";
150 NEXT
160 FOR Z=1 TO 40 : PRINT "■"; : NEXT
170 D$="■"
180 FOR Z=1 TO 10
190   D$=D$+"■"
200   PRINT D$ TAB(5) Z
210 NEXT
```

Program 2.

```
100 REM  PROGRAM 2A
110 PRINT "J";
120 FOR Z=1 TO 39 : PRINT "■";   NEXT
130 PRINT
140 FOR Z=1 TO 10
150 : PRINT "■" SPC(37) "■"
160 NEXT
170 FOR Z=1 TO 39 : PRINT "■";   NEXT
180 PRINT "■";
190 FOR Z=1 TO 10
200 : PRINT TAB(5) Z
210 NEXT
```

Program 2A.

Try running Program 2, which is intended to yield the display shown in Figure 6. Variable D$ is there to help avoid the problem of line skipping we encountered in Program 1. However, the result, shown in Figure 2, is not quite what we intended: the odd numbers were not TABbed. This is because they were in the second half of a 79-character line, and the TAB argument should have been 45, not 5.

There are various ways to get around these difficulties. The simplest is to avoid printing in the last column. This will guarantee that the line length is consistently 39 throughout the program, thereby solving the problems. (This suggestion refers to printing under program control, not to the keying in of the program, which of course should take advantage of the 79-character line possibility.) Programs 1A and 2A use this

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Figure 3. Program 1A output.

Figure 4. Program 2A output.

```
100 REM  EXPERIMENT 2
110 S=32768
120 INPUT M
130 PRINT "J";
140 FOR Z=S TO S+M : POKE Z,102 : NEXT
150 PRINT "M" PEEK(213)
160 RUN
```

Experiment 2.

```
100 REM  PROGRAM 1B
110 PRINT "J";
120 FOR Z=1 TO 39 : PRINT "Q",  NEXT
130 GOSUB 240 : PRINT
140 FOR Z=1 TO 10
150 : GOSUB 240
160 : PRINT "Q"
170 NEXT
180 FOR Z=1 TO 39 : PRINT "Q"; : NEXT
190 GOSUB 240
200 PRINT "K";
210 FOR Z=1 TO 10  PRINT "I" Z  NEXT
220 END
230
240 EL=256*PEEK(197)+PEEK(196)+39
250 POKE EL,102
260 RETURN
```

Program 1B.

```
100 REM  PROGRAM 2B
110 PRINT "J";
120 FOR Z=1 TO 39 : PRINT "Q"; : NEXT
130 GOSUB 260 : PRINT
140 FOR Z=1 TO 10
150 : GOSUB 260
160 : PRINT "Q"
170 NEXT
180 FOR Z=1 TO 39 : PRINT "Q"; : NEXT
190 GOSUB 260
200 PRINT "K";
210 FOR Z=1 TO 10
220 : PRINT TAB(5) Z
230 NEXT
240 END
250 :
260 EL=256*PEEK(197)+PEEK(196)+39
270 POKE EL,102
280 RETURN
```

Program 2B.

approach, and yield the displays shown in Figures 3 and 4, which closely resemble our original goal.

Another solution, if you must put a character in the last column, is to POKE it there. This is easy to do if you know the address you need to POKE. (If you don't, use the routine at the end of Program 1B and 2B to figure it out. The routine PEEKs into the memory locations mentioned above and adds 39 to get to the end of the screen line. Note that the routine assumes that the cursor is placed on the line whose last column you want POKEd.) While printing a character in the 40th position affects the length of the logical line, poking a character there does not. Use Experiment 2 to check this. Programs 1B and 2B use this fact to yield the desired display. Of course the entire box could have been POKEd onto the screen.

```
100 REM  PROGRAM 1C
110 PRINT "J";
120 FOR Z= 1 TO 40   PRINT "Q".   NEXT
130 FOR Z= 1 TO 10
140   PRINT "Q■■■■Q";
150 NEXT
160 FOR Z=1 TO 40 : PRINT "Q",   NEXT
170 PRINT "KQ";
180 FOR Z= 1 TO 10
190 : PRINT "■Q" Z;
200   P=POS(0) : LL=PEEK(213)
210   IF P<40 AND LL=79 THEN UP$="J"
220 : PRINT   PRINT UP$:   UP$=""
230 NEXT
```

Program 1C.

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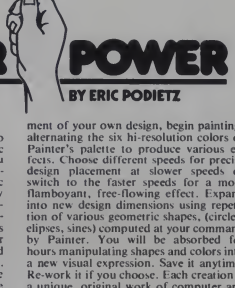

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CIRCLE 143 ON READER SERVICE CARD

```
100 REM   PROGRAM 1D
110 PRINT "■";
120 FOR Z=1 TO 40 : PRINT "■";   NEXT
130 FOR Z= 1 TO 10
140 : PRINT "■■■■■",
150 NEXT
160 FOR Z=1 TO 40 : PRINT "■";   NEXT
170 PRINT "■■",
180 FOR Z= 1 TO 10
190 : PRINT "■" Z;
200 : P=POS(0): IF P>40 THEN P=P-40
210 : PRINT SPC(40-P)
220 NEXT
```

Program 1D.

Yet another solution is to compensate for the problems caused by the 39/79 alternative. If printing the carriage return sent the cursor one line below your goal, print a "cursor up" followed by a semicolon to get it where you want it (Program 1C), or else simulate the carriage return with judicious use of the SPC function (Program 1D). If your TAB appears not to be working properly, use SPC (Program 2C), or attempt to add 40 to the argument (Program 2D). These piecemeal solutions are adequate for most purposes.

Study these programs, modify them, RUN them, and soon you will known all there is to know about this small PET problem. If you don't have the energy to do all this, buy yourself a new 80-column screen PET! □

```
100 REM   PROGRAM 2D
110 PRINT "■";
120 FOR Z=1 TO 40 : PRINT "■";   NEXT
130 FOR Z=1 TO 10
140 : PRINT "■■■■■■";
150 NEXT
160 FOR Z=1 TO 40 : PRINT "■";   NEXT
170 D$="■"
180 FOR Z=1 TO 10
190 : D$=D$+"■"
200 : PRINT D$ TAB(5-40*(POS(0)>39)) Z
210 NEXT
```

Program 2D.

```
100 REM   PROGRAM 2C
110 PRINT "■";
120 FOR Z=1 TO 40 : PRINT "■";   NEXT
130 FOR Z=1 TO 10
140 : PRINT "■■■■■■";
150 NEXT
160 FOR Z=1 TO 40 : PRINT "■";   NEXT
170 D$="■"
180 FOR Z=1 TO 10
190 : D$=D$+"■"
200 : PRINT D$ SPC(5) Z
210 NEXT
```

Program 2C.

```
100 REM          REMARKS
110 ·
120 REM   ALL PROGRAM LISTINGS ASSUME NEW POKES.
130 REM   FOR OLD POKES, REPLACE PEEK(213) WITH PEEK(242),
140 REM                          PEEK(196) WITH PEEK(224),
150 REM                          PEEK(197) WITH PEEK(225).
160 ·
170 REM   "■"=CLR (CLEAR THE SCREEN)
180 REM   "■"=HOME (CURSOR TO TOP LEFT OF SCREEN)
190 REM   "■"=CURSOR UP
200 REM   "■"=CURSOR DOWN
210 REM   "■"=CURSOR LEFT
220 REM   "■"=CURSOR RIGHT
230 ·
READY.
```

Remarks and an explanation of special characters used in the programs.

"I put one too many loops in this exercise program."

The Text Solution for APPLE II®

Now APPLE II® Owners Can Solve Text Problems With VIDEOTERM 80 Column by 24 Line Video Display Utilizing 7 X 9 Dot Character Matrix

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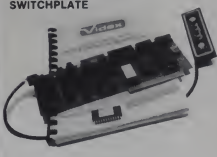
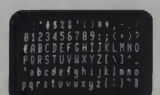
VIDEOTERM, MANUAL, SWITCHPLATE





7X12 MATRIX 18X80 OPTIONAL

7X9 MATRIX 24X80 STANDARD

VIDEOTERM

BASICs VIDEOTERM lists BASIC programs, both Integer and Applesoft, using the entire 80 columns. Without splitting keywords. Full editing capabilities are offered using the ESCape key sequences for cursor movement. With provision for stop/start text scrolling utilizing the standard Control-S entry. And simultaneous on-screen display of text being printed.

Pascal Installation of VIDEOTERM in slot 3 provides Pascal immediate control of the display since Pascal recognizes the board as a standard video display terminal and treats it as such. No changes are needed to Pascal's MISC.INFO or GOTOXY files, although customization directions are provided. All cursor control characters are identical to standard Pascal defaults.

Other Boards The new Microsoft Softcard™ is supported. So is the popular D. C. Hayes Micro-modem II™, utilizing customized PROM firmware available from VIDEX. The powerful EasyWriter™ Professional Word Processing System and other word processors are now compatible with VIDEOTERM. Or use the Mountain Hardware ROMWriter™ (or other PROM programmer) to generate your own custom character sets. Naturally, VIDEOTERM conforms to all Apple OEM guidelines, assurance that you will have no conflicts with current or future Apple II™ expansion boards.

Advanced Hardware Design VIDEOTERM is on-board asynchronous crystal clock ensures flicker-free character display. Only the size of the Pascal Language card, VIDEOTERM utilizes CMOS and low power consumption ICs, ensuring cool, reliable operation. All ICs are fully socketed for easy maintenance. Add to that 2K of on-board RAM, 50 or 60 Hz operation, and provision of power and input connectors for a light pen. Problems are designed out, not in.

Available Options The entire display may be altered to inverse video, displaying black characters on a white field. PROMs containing alternate character sets and graphic symbols are available from Videx. A switchplate option allows you to use the same video monitor for either the VIDEOTERM or the standard Apple II™ display, instantly changing displays by flipping a single toggle switch. The switchplate assembly inserts into one of the rear cut-outs in the Apple II™ case so that the toggle switch is readily accessible. And the Videx KEYBOARD ENHANCER can be installed, allowing upper and lower case character entry directly from your Apple II™ keyboard.

Firmware 1K of on-board ROM firmware controls all operation of the VIDEOTERM. No machine language patches are needed for normal VIDEOTERM use.

Firmware Version 2.0

Characters	7 x 9 matrix	Display	24 x 80 (full descenders)
Options	7 x 12 matrix option. Alternate user definable character set option. Inverse video option.		18 x 80 (7 x 12 matrix with full descenders)

Want to know more? Contact your local Apple dealer today for a demonstration. VIDEOTERM is available through your local dealer or direct from Videx in Corvallis, Oregon. Or send for the VIDEOTERM Owners Reference Manual and deduct the amount if you decide to purchase. Upgrade your Apple II™ to full terminal capabilities for half the cost of a terminal. VIDEOTERM. At last.

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Micromodem II™ is a trademark of D. C. Hayes Associates Inc.
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- MICROMODEM FIRMWARE — $ 25

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Introducing the

KEYBOARD & DISPLAY ENHANCER

- ***PUT THE SHIFT AND SHIFT LOCK BACK WHERE IT BELONGS***
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- ***ACCESS ALL YOUR KEYBOARD ASCII CHARACTERS***

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If you want to program in BASIC, just put it back into the alpha lock mode, and you have the original keyboard back with a few improvements. Now you can enter those elusive 9 characters directly from the keyboard, or re quire the Control key to be pressed with the RESET to prevent accidental resets.

KEYBOARD AND DISPLAY ENHANCER is recommended for use with all revisions of the APPLE II. It includes 6 ICs, and EPROM and dip-switches mounted on a PC board, and a jumper cable. Easy installation, requiring no soldering or cutting traces. Alternate default modes are dip switch selectable. You can even remap the keyboard, selecting an alternate character set, for custom applications.

PRICE • KDE-700 (REV. 7 or greater)..... $129.
• KDE-000 (REV. 6 or less)..... $129.

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CIRCLE 240 ON READER SERVICE CARD

SAM: A New Type of Mortgage

Is It Best for You?

E. Lynn Crawford

With spiraling inflation and extremely high interest rates, lending institutions are developing new types of home mortgages to insure higher yields. The fixed rate, fixed term, instrument most of us know as a home mortgage is dead!

Throughout the United States, new mortgages known as "variable rate" or "roll over" mortgages are being used. This type of mortgage allows the lending institution to increase (or decrease) the interest rate, typically every three years, in step with the economy. This, of course, means increasing monthly mortgage payments through the years.

Now a new type of mortgage is being proposed by lending institutions. This mortgage is a "shared appreciation mortgage" or SAM. Basically it provides for the lending institution to participate in the appreciation of the home, the lending institution reduces the interest rate by two or three points (percent).

It works like this. In return for a one-third share of the appreciation, a bank will reduce the mortgage rate by three percent. Or in return for 25% of the appreciation, lending institutions will reduce the interest rate by two percent. If the home is sold within the allotted time, then the lending institution receives its share of the appreciation of the property.

If the home is not sold within the allotted time, the home is appraised and the lending institution's share is due and payable by the home owner. The mortgage may provide for this lump sum payment of interest income or shared appreciation to be added to the mortgage.

A reduction of three percent in the interest rate can mean a substantial reduction in monthly payments, allowing the buyer to purchase a larger home or spend less per month on a smaller home. But computing the possibility of gain or loss overall (interest cost plus loss of shared appreciation) is almost impossible without the aid of a computer.

Question, is this type of mortgage in the best interest of the home owner? The following program for the TRS-80 can provide the answer. □

Lynn Crawford, 8045 Oaklandon Rd., Indianapolis, IN 46236.

SAM MORTGAGE COMPARISONS

THE COMPARISONS BELOW ARE BASED ON THE FOLLOWING INFORMATION:

	STANDARD MORTGAGE	SAM MORTGAGE
SALES PRICE	$ 40,000.00	$ 40,000.00
INITIAL MORTGAGE	$ 30,000.00	$ 30,000.00
INTEREST RATE	14.0000%	11.0000%
MONTHLY PAYMENT	$ 473.95	$ 380.93
SHARED PERCENTAGE	-0-	33.300%
APPRECIATION RATE	12.0000%	12.0000%

THE COMPARISONS WILL BE RUN FOR 5 YEARS.

** ALL FIGURES ARE BELIEVED ACCURATE BUT ARE NOT GUARANTEED. **

AMORIZATION DETAILS

YEAR	TYPE	TOTAL INTEREST	PRINCIPAL REDUCTION	PRINCIPAL BALANCE	CURRENT APPRECIATION	PROPERTY VALUE
1	STD	$ 4,100.75	$ 1,586.65	$ 28,413.30	$ 4,800.00	$ 44,800.00
	SAM	$ 3,233.91	$ 1,337.25	$ 28,662.80	$ 4,800.00	$ 44,800.00
		TOTAL EQUITY	SHARE EQUITY	LENDERS EQUITY	NET EQUITY	LENDERS INCOME
	STD	$ 16,386.70	-0-	-0-	$ 16,386.70	$ 4,100.75
	SAM	$ 16,137.20	$ 4,800.00	$ 1,598.40	$ 14,538.80	$ 4,832.31

YEAR	TYPE	TOTAL INTEREST	PRINCIPAL REDUCTION	PRINCIPAL BALANCE	CURRENT APPRECIATION	PROPERTY VALUE
2	STD	$ 7,964.54	$ 3,410.26	$ 26,589.70	$ 5,376.00	$ 50,176.00
	SAM	$ 6,313.08	$ 2,829.24	$ 27,170.80	$ 5,376.00	$ 50,176.00
		TOTAL EQUITY	SHARE EQUITY	LENDERS EQUITY	NET EQUITY	LENDERS INCOME
	STD	$ 23,586.30	-0-	-0-	$ 23,586.30	$ 12,065.30
	SAM	$ 23,005.20	$ 10,176.00	$ 3,388.61	$ 19,616.60	$ 12,935.60

YEAR	TYPE	TOTAL INTEREST	PRINCIPAL REDUCTION	PRINCIPAL BALANCE	CURRENT APPRECIATION	PROPERTY VALUE
3	STD	$ 11,556.00	$ 5,506.21	$ 24,493.80	$ 6,021.12	$ 56,197.10
	SAM	$ 9,219.60	$ 4,493.88	$ 25,506.10	$ 6,021.12	$ 56,197.10
		TOTAL EQUITY	SHARE EQUITY	LENDERS EQUITY	NET EQUITY	LENDERS INCOME
	STD	$ 31,703.30	-0-	-0-	$ 31,703.30	$ 23,621.30
	SAM	$ 30,691.00	$ 16,197.10	$ 5,393.64	$ 25,297.40	$ 24,160.20

YEAR	TYPE	TOTAL INTEREST	PRINCIPAL REDUCTION	PRINCIPAL BALANCE	CURRENT APPRECIATION	PROPERTY VALUE
4	STD	$ 14,834.40	$ 7,915.17	$ 22,084.80	$ 6,743.66	$ 62,940.80
	SAM	$ 11,933.50	$ 6,351.16	$ 23,648.80	$ 6,743.66	$ 62,940.80
		TOTAL EQUITY	SHARE EQUITY	LENDERS EQUITY	NET EQUITY	LENDERS INCOME
	STD	$ 40,855.90	-0-	-0-	$ 40,855.90	$ 38,455.70
	SAM	$ 39,291.90	$ 22,940.80	$ 7,639.28	$ 31,652.70	$ 38,339.40

YEAR	TYPE	TOTAL INTEREST	PRINCIPAL REDUCTION	PRINCIPAL BALANCE	CURRENT APPRECIATION	PROPERTY VALUE
5	STD	$ 17,753.10	$ 10,683.90	$ 19,316.10	$ 7,552.89	$ 70,493.70
	SAM	$ 14,432.50	$ 8,423.35	$ 21,576.70	$ 7,552.89	$ 70,493.70
		TOTAL EQUITY	SHARE EQUITY	LENDERS EQUITY	NET EQUITY	LENDERS INCOME
	STD	$ 51,177.60	-0-	-0-	$ 51,177.60	$ 56,208.80
	SAM	$ 48,917.00	$ 30,493.70	$ 10,154.40	$ 38,762.60	$ 55,286.90

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The Minnesota Educational Computer Consortium (MECC) was founded in 1973 with the goal of extending the benefits of computers to every school in the state. Over the years, MECC has developed procedures for finding and perfecting programs from contributors throughout the state.

Few Programs Quality

Before a program is accepted for the MECC library it is judged on specific criteria. For example:

1) Accuracy... Is all spelling and grammer correct? Does each question provide for a correct and appropriate response?

2) Audience... Is the intended audience (grade level and subject) served by the degree of difficulty and scope of the program? Is the reading level of the text material suitable?

3) Clarity... Are explanations and instructions sufficient, clear and straight forward? Is the presentation well-formatted?

4) Graphics... Are the graphics appropriate and sufficient in quantity?

Other criteria include documentation, function, programming, and the like. Similar criteria are applied to the documentation. This ensures that the reading level is appropriate, that objectives are well-stated and that associated materials are available.

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Apple Demonstration Diskette
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A sample of the different kinds of applications available on the MECC diskettes is shown. The software demonstrates applications in drill and practice, tutorial, simulation, problem solving, and worksheet generation. Samples from music, science, social studies, industrial arts, reading and mathematics are provided.

Elementary—Volume 1 (Mathematics)
MECC-702, $24.95

The first elementary diskette contains programs to be used in the elementary mathematics classroom. Games of logic such as BAGELS, TAXMAN, and NUMBER, drill and practice programs, such as SPEED DRILL, ROUND, and CHANGE, and programs about the metric system such as METRIC ESTIMATE, METRIC LENGTH, and METRIC 21 are included on the diskette.

Elementary—Volume 2 (Language Arts)
MECC-703, $24.95 (Available 7/81)

The teacher can enter lists of spelling words in the computer and have them used by the program SPELL, which drills students on the spelling. MIXUP which presents the word in mixed up order, or WORD FIND, which will create a word find puzzle for the teacher to duplicate. If words and definitions are entered, a CROSS WORD puzzle can be generated or a WORD GAME can be played. Two other programs included on this diskette are TALK, a program designed to introduce students to the computer or AMAZING which prints out worksheet mazes. Several programs on the diskette use a printer.

Elementary—Volume 3 (Social Studies)
MECC-704, $24.95 (Available 7/81)

The spell series, SELL APPLES, SELL PLANTS, SELL LEMONADE, and SELL BICYCLES which appears on the ELEMENTARY VOLUME 3 diskette can be used to teach elementary economics to students in grades 3-6. CIVIL will reinact battles of the CIVIL war while STATES and STATES2 provide drill and practice on the location of states in the U.S. and their capitals.

Elementary—Volume 4 (Mathematics And Science)
MECC-705, $24.95

Two mathematics programs ESTIMATE and MATHGAME provide reinforcement on estimating and basic facts. Food chains in fish can be studied through ODELL LAKE while ODELL WOODS deals with food chains in animals. SOLAR DISTANCE teaches the concepts of distances in space and URSA provides a tutorial on constellations.

Elementary—Volume 5 (Language Arts)
MECC-710, $24.94 (Available 7/81)

ELEMENTARY—VOLUME 5 deals with the reading concept of prefixes. The diskette contains five lessons which both teach the prefixes of UN, RE, DIS, PRE, and IN. Two review drills, DRAGON FIRE and PRE-APP II, are also contained on the diskette.

Elementary—Volume 6
MECC-725, $24.95 (Available 7/81)

Historical simulations. OREGON, VOYAGEUR and FURS are included in the ELEMENTARY—VOLUME 6 diskette. Along with these programs are NOMAD which teaches map reading and SUMER.

Special Needs—Volume 1 (Spelling)
MECC-727, $24.95 (Available 7/81)

This diskette is designed to drill handicapped students on frequently misspelled primary and intermediate words. Students answer problems by either using the game buttons, the game paddles or any key on the keyboard.

Science—Volume 2 (Senior High)
MECC-709, $24.95 (Available 7/81)

Many of the programs on this diskette were developed by Minnesota teachers. PEST, which deals with the use of pesticides, and CELL MEMBRANE which the user takes the part of a cell membrane, can be used in biology classes. SNELL plots light refraction demonstrating SNELL's law while COLLIDE simulates the collision between two bodies. DIFFUSION deals with the diffusion rates of various gases, NUCLEAR SIMULATION shows radioactive decay of nine different radioisotopes. ICBM and RADAR teach angles and projections on a coordinate system.

Science—Volume 3 (Middle School)
MECC-707, $24.95 (Available 7/81)

The FISH program through the use of low resolution graphics show the circulatory system of a fish. Simulations like ODELL LAKE which is used to explore food chains, URSA which teaches about constellations, and QUAKES which simulates earthquakes are on the diskette. MINERALS can be used in the area of earth science to identify 29 minerals by having students perform simple tests.

Mathematics—Volume 1 (Senior High)
MECC-706, $24.95 (Available 7/81)

BAGELS, SNARK, ICBM, and RADAR will teach students logic while reinforcing the concepts of plotting prints or angle measurements. ALEGBRA provides a drill and practice in solving equations. Three programs on the diskette can be used in plotting equations on a grid: SLOPE which is designed for use in ninth grade with linear functions, POLYGRAPH which will plot any equation on a rectangular coordinate system, and POLAR which graphs functions on polar coordinates.

Aesthesometry teaches the topic of curves by viewing curves from two perspectives. The first method demonstrates the 'space concepts' of elliptical, parabolic, and hyperbolic curves. Curve sketching designs are developed to provide an aesthetic view of geometric shapes. The second method uses a mathematical approach and defines a curve as the intersection of planes with a cone. The support booklet provides worksheets and classroom ideas.

Teacher Utilities—Volume 1
MECC-715, $24.95 (Available 7/81)

The TEACHER UTILITIES diskette is designed to aid the teacher and would not be used by the student unless the teacher creates questions using the REVIEW program. This program allows the teacher to set up a list of questions which can be used either by the REVIEW program or the TEST GENERATOR program. The teacher can also make CROSS WORD puzzles, WORD FIND puzzles, BLOCK LETTER banners and POSTERS using the program FREQUENCY and PERCENT can be used to calculate grades and to do statistical analyses. A printer is needed for some of the programs on this diskette.

Programmer's Aid—Volume 1
MECC-720, $32.95 (Available 7/81)

The PROGRAMMER's AID diskette provides help for the programmer. Programs to be able to UPLOAD and DOWNLOAD to the MECC system, programs that work with text files, EDIT-FP TO TEXT, RANDOM EDITOR, SEQUENTIAL EDITOR and TEXT LIST along with programs to work with binary files, BINARY FILE INFO, BINARY FILE TO PR are included. Two programs TABLES and MERGE allow the user to create, change and merge graphic shapes for use in a program. FREE SPACE will tell the amount of space on the diskette while HIDDEN CHARACTERS will locate contol character. STARTER will put standard routines such as space bar, music, graphic characters or input into a user's program which is just being created or already created.

MICAS—Volume 1
MECC-721, $32.95 (Available 7/81)

Microcomputer Integrated Computerized Accounting System requires dual disks and 132 characters width printer. The MICAS computerized accounting system provides a realistic experience with automated accounting systems. The package consists of four integrated systems: (1) general ledger, (2) accounts payable, (3) accounts receivable, and (4) inventory control.

Shape Tables—Volume 1
MECC-724, $24.95 (Available 7/81)

The SHAPE TABLES diskette includes 12 files of 187 shapes that can be incorporated in a user's program. Also included are aids needed to work with shape tables.

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CIRCLE 130 ON READER SERVICE CARD

SAM, continued...

Program Listing

```
10  '* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
20  '*                                                           *
30  '*                    SAM MORTGAGE COMPARISONS               *
40  '*                                                           *
50  '*    A PROGRAM TO COMPARE INTEREST EXPENSE OF FIXED TERM    *
60  '* FIXED RATE MORTGAGES WITH THE EXPENSE OF SAM (SHARED      *
70  '* APPRECIATION MORTGAGES) TYPE MORTGAGES.                   *
80  '*                                                           *
90  '*                              BY E. LYNN CRAWFORD          *
100 '*                                3/5/81                     *
110 '* ALL RIGHTS RESERVED                                       *
120 '* * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
130 '
140 '
150 '                        * VARIABLE LIST *
160 '
170 'EQUITY VARIABLES
180 '     NE = NET EQUITY
190 '     SR = SHARE PERCENTAGE RATE
200 '     SE = SHARE EQUITY
210 '     TE = TOTAL EQUITY
220 '     LE = LENDERS EQUITY
230 'APPRECIATION VARIABLES
240 '     AR = APPRECIATION RATE AVERAGE OVER N YEARS
250 '     TA = TOTAL APPRECIATION
260 '     YA = YEARLY APPRECIATION
270 'INTEREST VARIABLES
280 '     AI = ACCUMULATED INTEREST
290 '      I = INTEREST
300 '     IR = INTEREST RATE
310 '     MI = MONTHLY INTEREST
320 '     TI = TOTAL YEARLY INTERST
330 '     PR = PERCENTAGE RATE
340 'PRINCIPAL VARIABLES
350 '     PV = PROPERTY VALUE
360 '     SP = SALES PRICE
370 '      P = PAYMENT
380 '     PB = PRINCIPAL BALANCE
390 '     PR = PRINCIPAL REDUCTION
400 '     TP = TOTAL PRINCIPAL REDUCTION
410 'MISCELLANEOUS
420 '      L = LOOP
430 '      N = NUMBER OF YEARS
440 '      M = MONTHS
450 '    HC$ = HARD COPY
460 '     Q$ = QUESTION
470 '      X = SWITCH FROM STANDARD TO SAM AND BACK
480 '     TL = TIMING LOOP
490 '      C = CORRECTION
500 '    U$ = PRINT USING STRINGS (UA$ THRU UI$)
510 '     LI = LENDER'S INCOME
520 '     X$ = TYPE STRING
530 '     PL = PAGE LENGTH
540 '      Z = FOR NEXT LOOP
550 GOSUB 2660 '              > FOR NAME BLOCK
560 '
570 '
580 '                    * TO INITIALIZE *
590 '
600 UA$ = "     $###,###.##                        $###,###.##"
610 UB$ = "          -0-                             ##.####%"
620 UC$ = "       ##.####%                           ##.####%"
630 UD$ = "$###,###.##"
640 UE$ = " ##"
650 UF$ = "    %  %    $###,###.##  $###,###.##  $###,###.##
    $###,###.##  $###,###.##"
660 UG$ = "    %  %    $###,###.##          -0-          -0-
    $###,###.##  $###,###.##"
670 UH$ = "$###,###.##     $###,###.##"
680 UI$ = "          -0-      $###,###.##"
690 '
700 '
710 '                    * TO ENTER DATA *
720 '
730 CLS
740 PRINT "TO ENTER DATA, SIMPLY RESPOND TO THE QUESTIONS ASKED
    BY THE      COMPUTER."
750 PRINT "PLEASE ENTER THE DATA IN DECIMAL FORM, WITHOUT THE
USE OF COMMASOR $ SIGNS."
```

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SAM, continued...

```
760 PRINT "FOR EXAMPLE, 12 3/4% INTEREST WOULD BE ENTERED AS
 .1275 AND    $3,650.45 WOULD BE ENTERED AS 3650.45."
770 GOSUB 2400
780 GOSUB 2410
790 GOSUB 2420
800 GOSUB 2430
810 GOSUB 2440
820 GOSUB 2450
830 GOSUB 2460
840 GOSUB 2470
850 GOSUB 2480
860 GOSUB 2490
870 PV = SP
880 GOSUB 2500
890 PB(1) = PB
900 PB(2) = PB
910 '
920 '
930 '                    * DATA ENTRY CORRECTION & RECAP *
940 '
950 CLS
960 PRINT TAB(18) "SAM MORTGAGE COMPARISONS"
970 PRINT "(1) HARD COPY PRINTOUT? - ";HC$
980 PRINT "(2) SALES PRICE OR INITIAL VALUE = ";
990 PRINT USING US$; SP
1000 PRINT "(3) INITIAL MORTGAGE BALANCE = ";
1010 PRINT USING US$; PB
1020 PRINT "(4) ANTICIPATED AVERAGE APPRECIATION RATE PER YEAR ";PR(4);"%"
1030 PRINT "(5) COMPARISONS TO BE MADE OVER ";N;" YEARS."
1040 PRINT TAB(10) "STANDARD MORTGAGE DATA:"
1050 PRINT "(6) INTEREST RATE = ";PR(1);"%"
1060 PRINT "(7) MONTHLY PAYMENT = ";
1070 PRINT USING US$;P(1)
1080 PRINT TAB(10) "SAM MORTGAGE DATA:"
1090 PRINT "(8) INTEREST RATE = ";PR(2);"%"
1100 PRINT "(9) MONTHLY PAYMENT = ";
1110 PRINT USING US$;P(2)
1120 PRINT "(10) MORTGAGE COMPANY SHARES ";PR(3);"%"
1130 INPUT "DO YOU WANT TO CORRECT ANY OF THE DATA SHOWN";Q$
1140 IF LEFT$(Q$,1) = "Y" GOTO 1160
1150 GOTO 1190
1160 INPUT "ENTER ITEM NUMBER YOU WANT TO CORRECT";C
1170 ON C GOSUB 2490 ,2400 ,2410 ,2480 ,2470 ,2420 ,2430 ,2440 ,2450 ,2460
1180 GOTO 870
1190 CLS
1200 PRINT CHR$(23)
1210 PRINT @ 462, "ONE MOMENT PLEASE"
1220 IF LEFT$(HC$,1) = "Y" GOSUB 2090
1230 '
1240 '
1250 '                    * MATH COMPUTATIONS *
1260 '
1270 FOR L = 1 TO N
1280 FOR X = 1 TO 2
1290 FOR M = 1 TO 12
1300 I(X) = IR(X) * PB(X)
1310 MI(X) = I(X)/12
1320 PR(X) = P(X) - MI(X)
1330 TI(X) = TI(X) + MI(X)
1340 TP(X) = TP(X) + PR(X)
1350 PB(X) = PB(X) - PR(X)
1360 IF PB(X) < P(X) GOTO 2760
1370 NEXT M
1380 NEXT X
1390 Y = Y + 1
1400 YA = AR * PV
1410 PV = PV + YA
1420 TE(1) = PV - PB(1)
1430 TE(2) = PV - PB(2)
1440 SE = PV - SP
1450 LE = SE * SR
1460 NE(1) = TE(1)
1470 NE(2) = PV - PB(2) - LE
1480 AI(1) = AI(1) + TI(1)
1490 AI(2) = AI(2) + TI(2)
1500 LI = LE + AI(2)
1510 IF LEFT$(HC$,1) = "Y" GOTO 1860
1520 INPUT "PRESS ENTER TO CONTINUE";Q$
1530 '
1540 '
1550 '                    * SCREEN PRINTOUT *
1560 '
1570 CLS
1580 PRINT "COMPARISONS FOR YEAR NUMBER ";Y
1590 PRINT "                                        STD MTG          SAM MTG"
1600 PRINT "TOTAL INTEREST";
1610 PRINT TAB(30) USING US$;TI(1);TI(2)
1620 PRINT "PRINCIPAL REDUCTION";
1630 PRINT TAB(30) USING US$;TP(1);TP(2)
```

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80-U.S.

SAM, continued...

```
1640 PRINT "PRINCIPAL BALANCE";
1650 PRINT TAB(30) USING UH$;PB(1);PB(2)
1660 PRINT "CURRENT APPRECIATION";
1670 PRINT TAB(30) USING UH$;YA;YA
1680 PRINT "PROPERTY VALUE";
1690 PRINT TAB(30) USING UH$;PV;PV
1700 PRINT "TOTAL EQUITY";
1710 PRINT TAB(30) USING UH$;TE(1);TE(2)
1720 PRINT "SHARE EQUITY";
1730 PRINT TAB(30) USING UI$;SE
1740 PRINT "LENDERS' EQUITY";
1750 PRINT TAB(30) USING UI$;LE
1760 PRINT "NET EQUITY";
1770 PRINT TAB(30) USING UH$;NE(1);NE(2)
1780 PRINT "LENDERS INCOME";
1790 PRINT TAB(30) USING UH$;AI(1);LI
1800 PRINT
1810 NEXT L
1820 INPUT "PRESS ENTER TO CONTINUE";Q$
1830 GOTO 2890
1840 '
1850 '
1860 '                    * PRINTING SUBROUTINE *
1870 '
1880 CLS
1890 PRINT @ 470,"PRINTING YEAR NUMBER ";Y
1900 LPRINT "                              TOTAL      PRINCIPAL      PRINCIPAL
     CURRENT          PROPERTY"
1910 LPRINT "YEAR   TYPE        INTEREST      REDUCTION      BALANCE
   APPRECIATION        VALUE"
1920 X$ = "STD"
1930 LPRINT USING UE$;Y;
1940 LPRINT USING UF$;X$;TI(1);TP(1);PB(1);YA;PV
1950 X$ = "SAM"
1960 LPRINT TAB(3) USING UF$;X$;TI(2);TP(2);PB(2);YA;PV
1970 LPRINT TAB(17) " TOTAL          SHARE          LENDERS
  NET          LENDERS"
1980 LPRINT TAB(17) "EQUITY          EQUITY          EQUITY
    EQUITY          INCOME"
1990 X$ = "STD"
2000 LPRINT TAB(3) USING UG$;X$;TE(1);NE(1);AI(1)
2010 X$ = "SAM"
2020 LPRINT TAB(3) USING UF$;X$;TE(2);SE;LE;NE(2);LI
2030 LPRINT CHR$(138):LPRINT CHR$(138)
2040 GOSUB 2570
2050 NEXT L
2060 GOTO 2890
2070 '
2080 '
2090 '                    * HARD COPY RECAP *
2100 '
2110 LPRINT TAB(28) "SAM MORTGAGE COMPARISONS"
2120 LPRINT CHR$(138)
2130 LPRINT TAB(5) "THE COMPARISONS BELOW ARE BASED ON THE
FOLLOWING INFORMATION:"
2140 LPRINT CHR$(138)
2150 LPRINT TAB(31) "STANDARD MORTGAGE                SAM MORTGAGE"
2160 LPRINT "SALES PRICE";
2170 LPRINT TAB(30) USING UA$;SP;SP
2180 LPRINT "INITIAL MORTGAGE";
2190 LPRINT TAB(30) USING UA$;PB;PB
2200 LPRINT "INTEREST RATE";
2210 LPRINT TAB(30) USING UC$;PR(1);PR(2)
2220 LPRINT "MONTHLY PAYMENT";
2230 LPRINT TAB(30) USING UA$;P(1);P(2)
2240 LPRINT "SHARED PERCENTAGE";
2250 LPRINT TAB(30) USING UB$; PR(3)
2260 LPRINT "APPRECIATION RATE";
2270 LPRINT TAB(30) USING UC$;PR(4);PR(4)
2280 LPRINT CHR$(138)
2290 LPRINT "THE COMPARISONS WILL BE RUN FOR ";N;" YEARS."
2300 LPRINT CHR$(138)
2310 LPRINT " ** ALL FIGURES ARE BELIEVED ACCURATE BUT ARE NOT GUARANTEED.**
2320 FOR Z = 1 TO 3: LPRINT CHR$(138): NEXT Z
2330 LPRINT TAB(30) "AMORIZATION DETAILS"
2340 LPRINT CHR$(138)
2350 RETURN
2360 '
2370 '
2380 '                    * DATA ENTRY SUBROUTINE *
2390 '
2400 INPUT "ENTER SALE PRICE OR INITIAL VALUE ";SP: RETURN
2410 INPUT "ENTER AMOUNT OF INITIAL MORTGAGE ";PB: RETURN
2420 INPUT "STANDARD MORTGAGE INTEREST RATE ";IR(1): RETURN
2430 INPUT "STANDARD MORTGAGE MONTHLY PAYMENT ";P(1): RETURN
2440 INPUT "          SAM MORTGAGE INTEREST RATE ";IR(2): RETURN
2450 INPUT "          SAM MORTGAGE MONTHLY PAYMENT ";P(2): RETURN
2460 INPUT "          SAM MORTGAGE SHARED PERCENTAGE ";SR: RETURN
2470 INPUT "NUMBER OF YEARS FOR WHICH YOU WANT TO MAKE COMPARISONS ";
     N: RETURN
```

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```
 10 VISMEM: CLEAR
 20 P=160: Q=100
 30 XP=144: XR=1.5*3.1415927
 40 YP=56: YR=1: ZP=64
 50 XF=XR/XP: YF=YP/YR: ZF=XR/ZP
 60 FOR ZI=-Q TO Q-1
 70 IF ZI<-ZP OR ZI>ZP GOTO 150
 80 ZT=ZI*XP/ZP: ZZ=ZI
 90 XL=INT(.5+SQR(XP*XP-ZT*ZT))
100 FOR XI=-XL TO XL
110 XT=SQR(XI*XI+ZT*ZT)*XF: XX=XI
120 YY=(SIN(XT)+.4*SIN(3*XT))*YF
130 GOSUB 170
140 NEXT XI
150 NEXT ZI
160 STOP
170 X1=XX+ZZ+P
180 Y1=YY-ZZ+Q
190 GMODE 1: MOVE X1,Y1: WRPIX
200 IF Y1=0 GOTO 220
210 GMODE 2: LINE X1,Y1-1,X1,0
220 RETURN
```

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CIRCLE 273 ON READER SERVICE CARD

SAM, continued...

```
2480 INPUT "AVERAGE YEARLY APPRECIATION DURING PERIOD ";AR: RETURN
2490 INPUT "DO YOU WANT A HARD COPY PRINTOUT ";HC$: RETURN
2500 PR(1) = IR(1)*100
2510 PR(2) = IR(2)*100
2520 PR(3) = SR*100
2530 PR(4) = AR*100
2540 RETURN
2550 '
2560 '
2570 '                          * PAGE LENGTH *
2580 '
2590 IF PEEK (16425) < 56 THEN RETURN
2600 PL = 66 - (PEEK(16425))
2610 FOR Z = 1 TO PL: LPRINT CHR$(138): NEXT Z
2620 POKE 16425,0
2630 RETURN
2640 '
2650 '
2660 '                          * TITLE BLOCK *
2670 '
2680 CLS
2690 PRINT CHR$(23)
2700 PRINT @ 452, "SAM MORTGAGE COMPARISONS"
2710 PRINT @ 584, "BY E. LYNN CRAWFORD"
2720 FOR TL = 1 TO 1500: NEXT TL
2730 RETURN
2740 '
2750 '
2760 '                          * END OF MORTGAGE TERM *
2770 '
2780 M = 12
2790 X = 2
2800 L = N
2810 PRINT "THE NEXT FIGURES WILL BE FOR THE FINAL MORTGAGE
  YEAR.  MORTGAGE FIGURES MAY NOT BE ACCURATE DUE TO ROUNDING.      ";
2820 IF LEFT$(HC$,1) = "Y" GOTO 2840
2830 GOTO 1390
2840 LPRINT "FINAL MORTGAGE YEAR.  MORTGAGE FIGURES MAY NOT
  BE ACCURATE DUE TO ROUNDING."
2850 LPRINT CHR$(138)
2860 GOTO 1390
2870 '
2880 '
2890 '                          * ANOTHER PRINTOUT? *
2900 '
2910 CLS
2920 PRINT:PRINT:PRINT:PRINT
2930 GOSUB 2600
2940 INPUT "DO YOU WISH TO RUN ANOTHER COMPARISON";Q$
2950 IF LEFT$(Q$,1) = "Y" GOTO 3020
2960 CLS
2970 PRINT CHR$(23)
2980 PRINT @ 466, "THANK YOU!"
2990 PRINT @ 590, "HAVE A NICE DAY."
3000 GOSUB 2720
3010 END
3020 CLEAR
3030 GOTO 580
```


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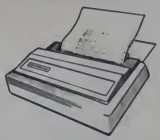

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CIRCLE 163 ON READER SERVICE CARD

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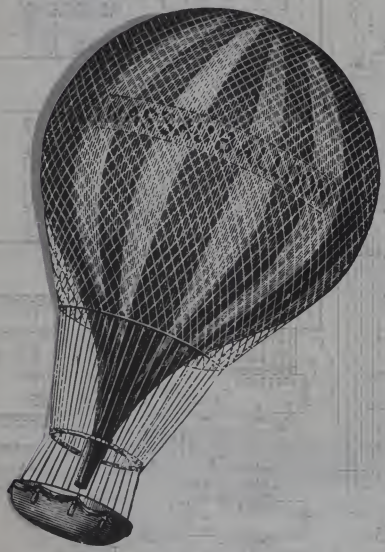
Traveller in your Computer

Chris Marvel



As in life, players have adventures together and learn to rely on one another.

"Put a Dungeon in Your Computer" in the July issue of *Creative Computing*, inspired me to adapt Glen Charnock's system to Traveller. In case you're not familiar with it, Traveller is one of a series of popular sci-fi "role playing" games not unlike Dungeons & Dragons. The big difference is that it deals with the future and possibly some predicted reality rather than fantasy, magic, and myth. Not that I am knocking D&D players—I play D&D myself on occasion. It's just that Traveller is easier to identify with, and for sci-fi nuts like me, it has adventure that can be savored.

What Is Traveller

Traveller, published by Game Designer's Workshop, 203 North St., Normal, IL 61761, is a "role-playing" game about future societies. It deals with their struggles and the technology that has enabled them to reach the stars. It postulates the probable problems societies will have with communication and transportation over the vastness of space.

The game is refereed in much the same manner as D&D. A referee generates characters and a universe for them to explore, and determines the course of play. He writes down each different planet, and for those which are habitable, he records continents, topography, oceans, cities and even, on occasion, different countries on the same planet.

Play begins with a referee creating a character for the player. Characters are created in a different environment from those in D&D. The characters' attributes are strength, dexterity, endurance, intelligence, education, and social standing. Since the society that the character has grown up in requires compulsory military service, each character must either enlist or be drafted. Most people choose the latter because by doing so they increase their chances of obtaining officer status on the first hitch.

Christopher Marvel, 1313 Beaufort, Laramie, WY 82070.

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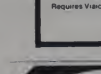

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CIRCLE 154 ON READER SERVICE CARD

If the player survives the first tour of service, he may reenlist. Benefits are bestowed on the player for rank, length of service, and branch of service (some branches are more hazardous than others). Prizes at the player's final discharge can include tickets for star travel, a yearly pension, all sorts of experience, a membership in the highly prized Traveller's Aid Society, and even, on a rare occasion, ownership of a star ship—Scout Class. Various attributes of one player may make him valuable to another. As in life, players have adventures together and learn to rely on one another.

The sooner the character is created, the sooner the player can start exploring the universe. A typical opening exchange may go something like this:

Referee (Playing the part of a customs official on Regina): "What is your destination?"

Player 1: "Dragonia."
Player 2: "Moonglow."
Referee: "Your tickets and passports please."
Player 1: "Here. One mid-passage."
Player 2: "Low passage."

Player 2, after being discharged as Third Officer in the Merchants, is on his way to pick up a newly-constructed Serpent Class Scout Ship on Moonglow. Heavily in debt to the tune of 21,630,000 credits. Player 2 has allied himself with Player 1. They have combined their funds to hire a band of mercenaries led by Player 3 to hijack the passenger starship. They will then be able to ransom the lives of all first class passengers and raise the funds to buy their dream. Player 4 has accepted a commission in the Imperial Navy and is sworn to uphold the loosely defined laws of the Imperial Confederation.

Referee: "Your weapons must be checked before entering the boarding area."

Player 3 emerges from hiding with nine mercenaries in battle dress equipped with laser carbines. Four Port Guard androids with laser rifles, alerted by startled passersby are thrown into action. They open fire hitting two mercenaries before being eliminated.

And so goes the play. The referee describes the action through the use of his tables and charts. Possibilities are infinite. Charts are endless. And too much of both tend, as in most role-playing games, to lessen the players' enjoyment.

Computerizing Traveller

I am totally convinced that computers can be employed successfully as tools to increase enjoyment and make life easier for the referee. For Pete's sake, if you don't have one it's a great excuse to buy a computer!

The following program modules take some of the drudgery out of refereeing while enabling the player to establish the basic worlds of the universe. To use this program all you need is a hex paper map sold in most hobby stores, colored pencils or press on numbers, and of course, your computer (in this case, I have used a TRS-80). Each record number as recorded on disk becomes a separate world occurrence and is marked on the hex map. As soon as the worlds have been created and marked, consult the jump generator to determine the routes for star lanes. Each world may then be neatly tucked away on disk or can be printed out using the NEWDOS JKL screen print command and stored in a notebook for future reference. If you decide to store on disk, the second program will read the file by record number and describe the world. Just record the record number on the hex map and presto, your map is linked to the computer. Oh, by the way, the program is written using NEWDOS80 DISK FILES and must be changed if you intend to run with TRSDOS. I have marked those lines for readers who wish to do this.

The following program modules take some of the drudgery out of refereeing while maintaining the referee concept.

The second module is a character generator which generates a Traveller character. This is interactive with each player making early decisions about his or her characters. The referee may advise the player about the best course of action besides helping to whet the player's appetite for adventure. In the end this will provide a neatly described character for both referee and player.

These are only a referee's aids and are not intended to limit his imagination. Most referees have very fertile imaginations.

For those readers who don't like typing code into your computer, I would be glad to send a copy. You provide a clean disk and $5. and I will provide you with a copy of the three programs listed. □

World Generator

```
10 'WORLD GENERATOR FOR TRAVELER(TM) - GAME DESIGNER WORKSHOP
20 'BY CHRISTOPHER C. MARVEL / MARVEL SOFTWARE  COPYRIGHT 1980
30 '1313 BEAUFORT, LARAMIE, WYOMING 82070
40 RANDOM
50 CLEAR1000:DEFSTR A:DIM P1$(15),P2$(15),P3$(15)
60 DEF FNB=RND(6)+RND(6)
70 DEF FNC=B2+B1
80 C1=0:B=0:B1=0:B2=0:RN=0
90 CLS:PRINTCHR$(23):PRINT:PRINT"* * * * * w o r l d  * * * * *"
100 PRINT"* * * g e n e r a t o r * * *"
110 PRINT:PRINT"*****************************************************
******* ";:PRINT:PRINT"                    BY"
120 PRINT:PRINT"CHRISTOPHER C. MARVEL"
140 PRINT:PRINT"                COPYRIGHT 1980"
150 FORJ=1TO3000:NEXT
160 CLS:PRINT@320,"GENERATE 1 - WORLDS OR 2 - JUMPS FOR PLANETS";:INPUT""!X
170 ONXGOTO 180,2050
180 OPEN"O",1,"WORLD/DAT","MF",150      'NEWDOS80 FILE
190 INPUT"DO YOU WISH TO GENERATE AN ENTIRELY NEW GALAXY ";A$:IFLEFT$(A$,
1)<>"N"THEN210
200 INPUT"LAST RECORD IN WORLD DATA FILE";RN ' UPDATE #GALAXY FILE
210 B=0:B1=0:B2=0:S1=0:S2=0:I=0:J=0:A0="0":P1$="":P2$="":P3$="":N$="" 'NEW
 #GALAXY
220 CLS:PRINT@320,"****************** W O R L D   G E N E R A T O R *****
******* ***"
230 B=RND(2)
240 IFB=2THEN270
250 PRINT"NO WORLD IN HEX";:INPUT"ENTER TO CONTINUE";X    'DOES WORLD
EXIST IN HEX
260 GOTO220
270 INPUT"NAME PLANET";N$
280 CLS:PRINT"******PLANET=====================";N$;"========="
 'GENERATE #LANET
290 GOSUB3070:GOSUB2120:GOSUB1870
 ;"101
300 PRINT"STARPORT.....................................
310 IFA1="A"PRINT"EXCELLENT. REFINED FUEL. ANNUAL MAINTENANCE. SH1PYARD
CAPABLE OFHANDLING STARSHIPS AND NO-STARSHIPS."
320 IFA1="B"PRINT"GOOD. REFINED FUEL. ANNUAL MAINTENANCE. SH1PYARD CAPABLE
OF CONSTRUCTING NON STARSHIPS."
330 IFA1="C"PRINT"ROUTINE. ONLY UNREFINED FUEL AVA1LAIBLE. REASONABLE
REPAIR  FACILITY PRESENT."
340 IFA1="D"PRINT"POOR. ONLY UNREFINED FUEL AVAILABLE. NO REPAIR.)
350 IFA1="E"PRINT"FRONTIER.  NO FUEL OR BASES."
```

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```
350 IFA1="X"PRINT"NO STARPORT "
370 IFS1=1PRINT"NAVAL BASE PRESENT"
380 IFS2=1PRINT"SCOUT BASE PRESENT"
390 IFA0="1"PRINT"RDSETTE WORLDS (3)"
400 IFA0="2"PRINT"RINGWORLDS"
410 IFA0="3"PRINT"SPHEREWORLDS - ARTIFICIAL ATMOSPHERE";AS="0"
420 PRINT"PLANETARY SIZE (MILES DIAMETER) ........."
430 IFA4="0"PRINT"ASTERDID/PLANETOID COMPLEX'
440 IFA4="1"PRINT"1000 "
450 IFA4="2"PRINT"2000 "
460 IFA4="3"PRINT"3000 "
470 IFA4="4"PRINT"4000 "
480 IFA4="5"PRINT"5000 "
490 IFA4="6"PRINT"6000 "
500 IFA4="7"PRINT"7000 "
510 IFA4="8"PRINT"8000 "
520 IFA4="9"PRINT"9000 "
530 IFA4="A"PRINT"10000 "
540 IFA4="B"PRINT"11000 "
550 IFA4="C"PRINT"12000 "
560 PRINT"PLANETARY ATMOSPHERE.................."
570 IFA5="0"PRINT"NONE"
580 IFA5="1"PRINT"TRACE"
590 IFA5="2"PRINT"VERY THIN,TAINTED"
600 IFA5="3"PRINT"VERY THIN"
610 IFA5="4"PRINT"THIN,TAINTED"
620 IFA5="5"PRINT"THIN"
630 IFA5="6"PRINT"STANDARD"
640 IFA5="7"PRINT"STANDARD,TAINTED"
650 IFA5="8"PRINT"DENSE"
660 IFA5="9"PRINT"DENSE,TAINTED"
670 IFA5="A"PRINT"EXDTIC"
680 IFA5="B"PRINT"CORRDSIVE
690 IFA5="C"PRINT"INSIDIOUS"
700 PRINT"HYDRDGRAPHIC % ....................."
710 IFA6="0"PRINT"NO FREE STANDING WATER"
720 IFA6="1"PRINT"10%"
730 IFA6="2"PRINT"20%"
740 IFA6="3"PRINT"30%"
750 IFA6="4"PRINT"40%"
760 IFA6="5"PRINT"50%"
770 IFA6="6"PRINT"60%"
780 IFA6="7"PRINT"70%"
790 IFA6="8"PRINT"80%"
800 IFA6="9"PRINT"90%"
810 IFA6="A"PRINT"ALL WATER. NO LAND MASSES"
820 PRINT"POPULATION.....................";
830 IFA7="0"PRINT"NONE"
840 IFA7="1"PRINT"10"
850 IFA7="2"PRINT"100"
860 IFA7="3"PRINT"1000"
870 IFA7="4"PRINT"10.000"
880 IFA7="5"PRINT"100.000"
890 IFA7="6"PRINT"1.000.000"
900 IFA7="7"PRINT"10.000.000"
910 IFA7="8"PRINT"100.000.000"
920 IFA7="9"PRINT"1.000.000.000"
930 IFA7="A"PRINT"10.000.000.000"
940 PRINT"GOVERNMENT TYPE.....
950 IFA8="0"PRINT"ND GDVERNMENT STRUCTURE. IN MANY CASES, FAMILY BONDS WILL
    PREDOMINATE.
960 IFA8="1"PRINT"COMPANY/CDRPORATIDN. RULING FUNCTIONS ARE ASSUMED BY A
COMPANY MANAGERIAL ELITE, AND MOST CITZENRY ARE COMPANY EMPLOYEES OR
DEPENDENTS."
970 IFA8="2"PRINT"PARTICIPATING DEMOCRACY. RULING FUNCTIDN DECISIONS ARE
REACHED BY ADVICE OF THE CITIZENRY DIRECTLY."
980 IFA8="3"PRINT"SELF PERPETUATING OLIGARCHY. RULING FUNCTIONS ARE
 PERFORMED BY  ARESTRICTED MINDRITY, WITH LITTLE OR NO INPUT FROM THE MASS
 OF  CITIZENRY"
990 IFA8="4"PRINT"REPRESENTATIVE DEMOCRACY. RULING FUNCTIONS ARE PERFORMED
 BY  ELECTED REPRESENTATIVES."
1000 IFA8="5"PRINT"FEUDAL TECHNOCRACY. RULING FUNCTIDNS ARE PERFORMED BY
SPECIFIC  INDIVIDUALS FOR PERSONS WHO AGREE TO BE RULED BY THEM. RELATIDN
SHIPS'ARE BASED ON THE PERFORMANCE OF TECHNICAL ACTIVITIES WHICH ARE
MUTUALLY  BENEFICIAL."
1010 IFA8="6"PRINT"CAPTIVE GOVERNMENT. RULING FUNCTIONS ARE PERFDRMED BY AN
IMPDSED LEADERSHIP FROM AN OUTSIDE GROUP. A COLONY OR CONQUERED AREA."
1020 IFA8="7"PRINT"BALKANIZATION. NO CENTRAL RULING AUTHORITY EXISTS! RIVAL
   GDVERNMENTS COMPETE FOR CONTROL. LAW LEVEL REFERS TO THE  GOVERNMENT NE
AREST THE STARPORT."
1030 IFA8="8"PRINT"CIVIL SERVICE BUREAUCRACY. RULING FUNCTIONS ARE PERFORMED
BY GOVERNMENT AGENCIES EMPLOYING INDIVIDUALS WITH A SELECTED  EXPERTISE."
1040 IFA8="9"PRINT"IMPERSONAL BUREAUCRACY. RULING FUNCTIONS ARE PERFORMED BY
   AGENCIES WHICH HAVE BECOME INSULATED FROM THE GOVERNED CITIZENRY
1050 IFA8="A"PRINT"CHARISMATIC DICTATORSHIP. RULING FUNCTIONS ARE PERFORMED
 BY AGENCIES DIRECTED BY A SINGLE LEADER WHO ENJDYS THE OVERWHELMING
CDNFIDENCE OF  THE CITIZENRY."
1060 IFA8="B"PRINT"NON-CHARISMATIC LEADER. APREVIOUS CHARISMATIC DICTATOR
HAS BE EN REPLACED BY A LEADER THROUGH NORMAL CHANNELS."
1070 IFA8="C"PRINT"CHARISMATIC OLIGARCHY. RULING FUNCTIONS ARE PERFORMED
 BY A  SELECT GROUP OF MEMBERS OF AN ORGANIZATION OR CLASS WHICH ENJOYSTHE
OVERWHELMING CDNFIDENCE OF THE CITIZENRY."
1080 IFA8="D"PRINT"RELIGIOUS DICTATORSHIP,RULING FUNCTIONS ARE PERFORMED BY
A RELIGIDUS ORGANIZATION WITHDUT REGARD TO THE SPECIFIC NEEDS OF
THE CITIZENRY'."
1090 B=VAL(A$):INPUT"ENTER TO CDNTINUE";X$:CLS:PRINT"LAW LEVEL.....
.....
1100 IFB=0PRINT"NO LAWS AFFECTING WEAPON POSSESSION DR WEAPON OWNERSHIP."
1110 IFB=1PRINT"CERTAIN WEAPONS ARE PROHIBITED,INCLUDING SPECIFICALLY
1)BODY PISTOLS WHICH ARE UNDETECTABLE BY STANDARD DETECTORS 2)EXPLOSIVE
WEAPONS SUCH AS  BOMBS OR GRENADES, AND 3) POISON GAS."
1120 IFB=2PRINT"PORTABLE ENERGY WEAPONS, SUCH AS LASER RIFLES OR
CARBINES ARE  PROHIBITED, SHIP'S GUNNERY IS NDT AFFECTED"
1130 IFB=3PRINT"WEAPDNS OF A STRICT MILITARY NATURE (SUCH AS MACHINE
GUNS OR  AUTOMATIC RIFLES, THDUGH NOT SUBMACHINEGUNS) ARE PRDHIBITED."
1140 INPUT"PRESS ENTER TO CONTINUE";X$
1150 IFB=4PRINT"LIGHT ASSAULT WEAPONS (SUCH AS SUBMACHINE GUNS) ARE
PRDHIBITED. "
1160 IFB=5PRINT"PERSDNAL CDNCEALABLE FIREARMS (SUCH AS PISTOLS AND
REVOLVERS)  ARE PROHIBITED."
1170 IFB=6PRINT"MOST FIREARMS  ARE PROHIBITED. THE CARRYINGDF ANY TYPE
OF WEAPON IS DISCOURAGED."
1180 IFB=7PRINT"SHOTGUNS ARE PROHIBITED."
1190 IFB=8PRINT"LONG BLADED WEAPONS (AL BLADE WEAPONS EXCEPT DAGGERS)
ARE STRICTLY CONTROLLED. OPEN POSSESSION IN PUBLIC IS PRDHIBITED.
OWNERSHIP IS,HOWEVER, NOT RESTRICTED."
1200 IFB=9PRINT"POSSESION OF ANY WEAPON OUTSIDE ONE'S HOME IS PRDHIBITED."
1210 INPUT"ENTER TO CDNTINUE";X$
1220 CLS:PRINT"TECNOLOGICAL INDEX.....
 ....."
1230 PRINT"========== WEAPDNS ==========
1240 PRINTAB(0)"PERSDNAL";TAB(20);"ARMOR";TAB(30);"SPECIAL";TAB(40);
"COMPUTERS"  ;TAB(50);"COMMUNICATIDN"
1250 IFT=0PRINTAB(0)"CLUB, CUDGEL, SPEAR";TAB(50)"RUNNERS"
1260 IFT=1PRINTAB(0)"DAGGER,PIKE,SWDRD";TAB(20);"JACK";TAB(30);
"CATAPULT";TAB(4 0);"ABACUS";TAB(50);"HELIOGRAPH"
1270 IFT=2PRINTAB(0)"HALBRED, BRDADSWORD";TAB(30);"CANNDN"
1280 IFT=3PRINTAB(0)"FOIL,CUTLASS,BLADE"
1290 IFT=3PRINT"BAYONET"
1300 IFT=4PRINTAB(0)"REVOLVER,SHOTGUN";TAB(20);"CLOTH";TAB(30);"ARTIL
LERY";TAB( 40);"ADDING";TAB(50);"TELEPHONES"
1310 IFT=4PRINTAB(40)"MACHINES"
```

The story behind the two best selling computer games books in the world.

Computer Games

by David H. Ahl

Everybody likes games. Children like tic tac toe. Gamblers like blackjack. Trekkies like Star Trek. Almost everyone has a favorite game or two.

It Started in 1971

Ten years ago when I was at Digital Equipment Corp. (DEC), we wanted a painless way to show reluctant educators that computers weren't scary or difficult to use. Games and simulations seemed like a good method.

So I put out a call to all our customers to send us their best computer games. The response was overwhelming. I got 21 versions of blackjack, 15 of nim and 12 of battleship.

From this enormous outpouring I selected the 90 best games and added 11 that I had written myself for a total of 101. I edited these into a book called 101 Basic Computer Games which was published by DEC. It still is.

When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

Contents of *Basic Computer Games* (right) and *More Basic Computer Games* (below).

Artillery-3
Baccarat
Bible Quiz
Big 6
Binary
Blackbox
Bobstones
Bocce
Boga II
Bumbrun
Bridge-It
Camel
Chase
Chuck-A-Luck
Close Encounters
Column
Concentration
Condot
Convoy
Corral
Countdown
Cup
Dealer's Choice
Deepspace
Deluse
Dodgem
Doors
Drag
Dr. Z
Eliza
Father
Flip
Four In A Row
Geowar
Grand Prix
Guess-It
ICBM
Inkblot
Joust
Jumping Balls
Keno
L Game
Life Expectancy
Lissajous
Magic Square
Man-Eating Rabbit
Maneuvers
Mastermind
Masterbagels
Matpuzzle
Maze
Millionaire
Minotaur
Motorcycle Jump
Nomad
Not One
Obstacle
Octrix
Pasart
Pasart 2
Pinball
Rabbit Chase
Roadrace
Rotate
Safe
Scales
Schmoo
Seabattle
Seawar
Shoot
Smash
Strike 9
Tennis
Tickertape
TV Plot
Twonky
Two-to-Ten
UFO
Under & Over
Van Gam
Warfish
Word Search Puzzle
Wumpus 1
Wumpus 2

Introduction
The Basic Language
Conversion to Other Basics
Acey Ducey
Amazing
Animal
Awari
Bagels
Banner
Basketball
Batnum
Battle
Blackjack
Bombardment
Bombs Away
Bounce
Bowling
Boxing
Bug
Bullfight
Bullseye
Bunny
Buzzword
Calendar
Change
Checkers
Chemist
Chief
Chomp
Civil War
Combat
Craps
Cube
Depth Charge
Diamond
Dice
Digits
Even Wins
Flip Flop
Football
Fur Trader
Golf
Gomoko
Guess
Gunner
Hammurabi
Hangman
Hello
Hexapawn
Hi-Lo
High I-O
Hockey
Horserace
Hurkle
Kinema
King
Letter
Life
Life For Two
Literature Quiz
Love
Lunar LEM Rocket
Master Mind
Math Dice
Mugwump
Name
Nicomachus
Nim
Number
One Check
Orbit
Pizza
Poetry
Poker
Queen
Reverse
Rock, Scissors, Paper
Roulette
Russian Roulette
Salvo
Sine Wave
Slalom
Slots
Splat
Stars
Stock Market
Super Star Trek
Synonym
Target
3-D Plot
3-D Tic-Tac-Toe
Tic Tac toe
Tower
Train
Trap
23 Matches
War
Weekday
Word

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So I put out a call to all our customers to send us their best computer games. The response was overwhelming. I got 21 versions of blackjack, 15 of nim and 12 of battleship.

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When I left DEC in 1974 I asked for the rights to print the book independently. They agreed as long as the name was changed.

Converted to Microsoft Basic

The games in the original book were in many different dialects of Basic. So Steve North and I converted all the games to standard Microsoft Basic, expanded the descriptions and published the book under the new name Basic Computer Games.

Over the next three years, people sent in improved versions of many of the games along with scores of new ones. So in 1979, we totally revised and corrected Basic Computer Games and published a completely new companion volume of 84 additional games called More Basic Computer Games. This edition is available in both Microsoft Basic and TRS-80 Basic for owners of the TRS-80 computer.

Today Basic Computer Games is in its fifth printing and More Basic Computer Games is in its second. Combined sales are over one half million copies making them the best selling pair of books in recreational computing by a wide margin. There are many imitators, but all offer a fraction of the number of games and cost far more.

The games in these books include classic board games like checkers. They include challenging simulation games like Camel (get across the desert on your camel) and Super Star Trek. There are number games like Guess My Number, Stars and Battle of Numbers. You'll find gambling games like blackjack, keno, and poker. All told there are 185 different games in these two books.

Whether you're just getting started with computers or a proficient programmer, you'll find something of interest. You'll find 15-line games and 400-line games and everything in between.

The value offered by these books is outstanding. Every other publisher has raised the price of their books yet these sell for the same price as they did in 1974.

Moneyback Guarantee

Examine one or both of these books and key some games into your computer. If you're not completely satisfied we'll refund the full purchase price plus your return postage.

Basic Computer Games costs only $7.50 and More Basic Computer Games just $7.95 for either the Microsoft or TRS-80 edition (please specify your choice on your order). Both books together are $15. Send payment plus $2.00 shipping and handling to Creative Computing Press, Morris Plains, NJ 07950. Visa, MasterCard and American Express orders should include card number and expiration date. Charge card orders may also be called in toll-free to 800-631-8112 (In NJ 201-540-0445).

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CIRCLE 350 ON READER SERVICE CARD

```
1320 IFT=5PRINTTAB(0)"CARBINE,RIFLE,SMG"!TAB(30)!"SANDCASTER"!TAB(40)!
"MODEL/1"!  TAB(50)!"RADIO"
1330 IFT=5PRINTTAB(0)"PISTOL"!TAB(30)!"MORTARS"
1340 IFT=6PRINTTAB(0)"AUTO RIFLE"!TAB(30)!"MISSILES":TAB(40)!"MODEL/1BIS
 "!TAB(50 )!"TELEVISION"
1350 IFT=7PRINTTAB(0)"BODY PISTOL"!TAB(20)!"MESH"!TAB(30)!"PULSE LASER"
!TAB(40)!  "  MODEL/2"
1360 IFT=8PRINTTAB(0)"LASER CARBINE"!TAB(28)!"AUTO-CANNON"!TAB(40)!
"MODEL/2BIS"
1370 IFT=9PRINTTAB(0)"LASER RIFLE"!TAB(20)!"ABLAT"!TAB(30)!"BM LASER"!
TAB(40)!"MODEL/3"
1380 IFT=10PRINTTAB(20)"REFLEC"!TAB(40)!"MODEL/4"
1390 IFT=11PRINTTAB(40)"MODEL/5"
1400 IFT=12PRINTTAB(40)"MODEL/6"
1410 IFT=13PRINTTAB(20)"BATTLE DRESS"+TAB(40)!"MODEL/7"
1420 IFT=17PRINTTAB(40)"ARTIFICIAL"
1430 IFT=17PRINTTAB(40)"INTELLIGIENCE"
1440 PRINT"==============TRANSPORTATION================="
1450 PRINTTAB(0)"WATER"!TAB(20)!"LAND"!TAB(30)!"AIR"!TAB(40)!"SPACE"!TAB
(50)!"FUELS"
1460 IFT=8PRINTTAB(0)"CONDES"+TAB(30)!"CORTE"+TAB(50)+"HUGLES"
1470 IFT=1PRINTTAB(0)"GALLEY"+TAB(20)!"WAGON"
1480 IFT=2PRINTTAB(50)"WIND"
1490 IFT=3PRINTTAB(0)"SAILING SHIPS"+TAB(30)!"HOT AIR BALLOON"+TAB(50)!
"WATER WHEEL"
1500 IFT=4PRINTTAB(0)"STEAMSHIPS"+TAB(20)!"TRAINS"+TAB(30)!"DIRIGIBLES"!
TAB(50)! "COAL"
1510 IFT=5PRINTTAB(20)"GROUND "+TAB(30)!"FIXED "!TAB(50)!"OIL"
1520 IFT=5PRINTTAB(20)"CAR"+TAB(30)!"WING"
1530 IFT=6PRINTTAB(0)"SUBMERSIBLES"+TAB(20)!"ATV,AFV"+TAB(30)!"ROTARY
WING"+TAB(50)!"FISSION"
1540 IFT=5ORT=6PRINTTAB(30)"AIRCRAFT"
1550 IFT=7PRINTTAB(0)"HOVERCRAFT"+TAB(20)!"HOVERCRAFT"+TAB(40)!
"NON-STARSHIP"+TAB(55)!"SOLAR"
1560 IFT=8PRINTTAB(30)"AIR/RAFT"+TAB(50)!"FUSION"
1570 IFT=9ANDT=(15PRINTTAB(40)"STARSHIPS"
1580 IFT=10PRINTTAB(40)"DRIVE H"
1590 IFT=11PRINTTAB(40)"DRIVE K"
1600 IFT=12PRINTTAB(30)"GRAV BELTS"!TAB(40)!"DRIVE N"
1610 IFT=13PRINTTAB(40)"DRIVE O"
1620 IFT=14PRINTTAB(40)"DRIVE U"
1630 IFT=)10ANDT=(14PRINTTAB(40)"OR LESS"
1640 IFT=15PRINTTAB(40)"ALL DRIVES"
1650 IFT=16PRINT"********** MATTER TRANSPORT **********"
1660 IFT=17PRINTTAB(50)"ANTI MATTER"
1670 PRINT:PRINT:PRINT"REFEREE MAY ADD TO ANY BLANK LINES"
1680 INPUT"DO YOU WISH TO ADD"!A$:IFLEFT$(A$,1)=="N"THEN1730
1690 INPUT"ADDITION TO TECHNOLOGICAL LEVEL - HOW MANY (MAX 3)"!B
1700 INPUT"NAME OF ADDITION"!P1$:IFB=1THEN1730
1710 INPUT"NAME OF ADDITION"!P2$:IFB=2THEN1730
1720 INPUT"NAME OF ADDITION"!P3$
1730 CLS:PRINT"PLANET=========================================="!N$:PRINT
1740 D$=A1+A4+A5+AB+A7+A8+A9+TF$:PRINT"UNIVERSAL PLANET PROFILE.........
..."!D$
1750 PRINT"TECH INDEX"!T
1760 PRINT"SPECIAL ADDITIONS"
1770 PRINTP1$:PRINTP2$:PRINTP3$
1780 INPUT"DO YOU WISH TO STORE DATA"!A$:IFLEFT$(A$,1)()"Y"THEN1800
1790 RN=RN+1:GOSUB 3230:PRINT"WORLD "!N$!" IS RECORD #"!RN!" ON WORLD
DATA FILE"
1800 INPUT"DO YOU WISH TO CONTINUE"!A2$
1810 IF LEFT$(A2$,1)()"N"THEN210
1820 CLOSE:END
1830 'TECH INDEX
1840 IFA1="A"B2=6:B2=FNC
1850 IFA1="B"B2=4:B2=FNC
1860 IFA1="C"B2=2:B2=FNC
1870 IFA1="X"B2=-4:B2=FNC
1880 IFA4="0"ORA4="1"B2=2:B2=FNC
1890 IFA4="2"ORA4="3"ORA4="4"B2=1:B2=FNC
1900 IFA5="0"ORA5="1"ORA5="2"ORA5="3"ORA5="A"ORA5="B"ORA5="C"ORA5="D"ORA5
="E"B2= 1:B2=FNC
1910 IFA6="9"B2=2:B2=FNC
1920 IFA6="A"B2=1:B2=FNC
1930 IFA7="1"ORA7="2"ORA7="3"ORA7="4"ORA7="5"B2=1:B2=FNC
1940 IFA7="9"B2=2:B2=FNC
1950 IFA7="A"B2=4:B2=FNC
1960 IFA8="0"ORA8="5":B2=FNC
1970 IFA8="D"B2=FNC
1980 T=ABS(RND(6)+B2)
1990 B=T
2000 IFB)9THEN2020
2010 TF$=RIGHT$(STR$(B),1)
2020 IFB=1BTF$="X"
2030 IFB=10TF$="A"
2040 IFB=11TF$="B"
2050 IFB=12TF$="C"
2060 IFB=13TF$="D"
2070 IFB=14TF$="E"
2080 IFB=15TF$="F"
2090 IFB=16TF$="G"
2100 IFB=17TF$="H"
2110 RETURN
2120 B=RND(14)-1
2130 GOSUB2330:A4=A2
2140 B1=B
2150 IFB1=0B=0:GOTO2170
2160 B=ABS(FNB-7+B1)
2170 GOSUB2330:A5=A2
2180 IFB1=1DRB1=0B=0:GOTO2210
2190 IFB1)9B=FNB-11:GOTO2210
2200 B=ABS(FNB-7+B1)
2210 GOSUB2330:A6=A2
2220 B=ABS(FNB-2)
2230 GOSUB2330:A7=A2
2240 B1=B1B=ABS(FNB-7+B1)
2250 GOSUB2330:A8=A2
2260 B1=B1B=ABS(FNB-7+B1)
2270 GOSUB2330:A9=A2
2280 B=RND(100)
2290 IFB=1A0="1"
2300 IFB=2A0="2"
2310 IFB=3A0="3"
2320 RETURN
2330 'WORLD RANDOMIZER
2340 IFB(0B=0
2350 IFB)9THEN2380
2360 A2=RIGHT$(STR$(B),1)
2370 RETURN
2380 IFB=10A2="A"
2390 IFB=11A2="B"
2400 IFB=12A2="C"
2410 IFB=13A2="D"
2420 RETURN

2430 DS=0:C1=0:CLS:PRINT"========================== JUMP GENERATOR ==========
======== ========":PRINT:PRINT    'DETERMINE JUMP ROUTES BETWEEN PLANETS
2440 INPUT"STARPORT 1 ="!A2
2450 INPUT"STARPORT 2 ="!A3
2460 INPUT"DISTANCE IN HEXES BETWEEN STAR PORTS"!DS
2470 B=RND(6)
2480 IFA2="A"THENGOSUB2580:GOTO2540
2490 IFA2="B"THENGOSUB2740:GOTO2540
2500 IFA2="C"ANDDS=(2THENGOSUB2920:GOTO2540
2510 IFA2="D"ANDDS=1THENGOSUB3000:GOTO2540
2520 IFA2="E"ANDDS=1THENGOSUB3040:GOTO2540
2530 IFA2="X"PRINT"NO SPACE LANE":GOTO2560
2540 IFC1=0PRINT"JUMP.........NO JUMP ROUTE"
2550 IFC1=1)PRINT"JUMP.........."!C1
2560 INPUT"GENERATE ANOTHER JUMP"!A$:IFLEFT$(A$,1)()
"N"THEN2430
2570 END
2580 IFDS=)2THEN2620
2590 IFA3="A"ORA3="B"ORA3="C"ORA3="D"ANDB=)1C1=1
2600 IFA3="E"ANDB=)2C1=1
2610 RETURN
2620 IFDS=)3THEN2680
2630 IFA3="A"ANDB=)2C1=2
2640 IFA3="B"ANDB=)3C1=2
2650 IFA3="C"ANDB=)4C1=2
2660 IFA3="D"ANDB=)5C1=2
2670 RETURN
2680 IFDS=)4THEN2710
2690 IFA3="A"ORA3="B"ANDB=)4C1=3
```

Traveller, continued...

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CIRCLE 231 ON READER SERVICE CARD

```
2700 IFA3="C"ANDB=6C1=3
2710 IFDS)4THEN2730
2720 IFA3="A"ORA3="B"ANDB=\'5C'=6
2730 RETURN
2740 IFDS=)2THEN2800
2750 IFA3="B"ANDB=)1C1=1
2760 IFA3="C"ANDB=)2C1=1
2770 IFA3="D"ANDB=)3C1=1
2780 IFA3="E"ANDB=)4C1=1
2790 RETURN
2800 IFDS=)5THEN2850
2810 IFA3="B"ANDB=)3C1=2
2820 IFA3="C"ANDB=)4C1=2
2830 IFA3="D"ANDB=6C1=2
2840 RETURN
2850 IFDS=)4THEN2890
2860 IFA3="B"ANDB=)4C1=3
2870 IFA3="C"ANDB=6C1=3
2880 RETURN
2890 IFDS()4THEN2910
2900 IFA3="B"ANDB=6C1=4
2910 RETURN
2920 IFDS=)2THEN2970
2930 IFA3="C"ANDB=)3C1=1
2940 IFA3="D"ANDB=)4C1=1
2950 IFA3="E"ANDB=)4C1=1
2960 RETURN
2970 IFDS=)3THEN2990
2980 IFA3="C"ANDB=6C1=2
2990 RETURN

3000 IFDS=)2RETURN
3010 IFA3="D"ANDB=)4C1=1
3020 IFA3="E"ANDB=)5C1=1
3030 RETURN
3040 IFDS=)2RETURN
3050 IFA3="E"ANDB=6C1=1
3060 RETURN
3070 'STARPORT
3080 B=FNB
3090 IFB=(6A1="A"!GOTO3150
3100 IFB=7ORB=6A1="B"!GOTO3150
3110 IFB=7ORB=6A1="C"!GOTO3170
3120 IFB=9A1="D"!GOTO3170
3130 IFB=10ORB=11A1="E"!GOTO3220
3140 IFB=12A1="X"!GOTD3220
3150 B=FNB
3160 IFB=)BS1=1
3170 B=FNB
3180 IFA1="A"ANDB=)1052=1
3190 IFA1="B"ANDB=)952=1
3200 IFA1="C"ANDB=)852=1
3210 IFA1="D"ANDB=)752=1
3220 RETURN
3230 'DISK SAVE
3240 A$=A1+A4+A5+A6+A7+AB+A9+TF$+A0
3250 PUT 1,RN,,N$,A$,P1$,P2$,P3$,S1X,S2%:
3260 RETURN
```

```
10 'WORLD GENERATOR FOR TRAVELER(TM) - GAME DESIGNER
WORKSHOP
20 'BY CHRISTOPHER C. MARVEL  CDPYRIGHT 1980
30 '1313 BEAUFORT, LARAMIE, WYOMING 82070
40 RANDOM
50 CLEAR1000:DEFSTRA
60 C1=01B=01B1=01B2=01RN=0

70 CLS:PRINTCHR$(23);PRINT:PRINT"* * * * * w o r l d * * * * *"
80 PRINT"* * * * * R E A D E R * * * *"
90 PRINT:PRINT"*************************************************
******* !PRINT:PRINT"                    BY"
100 PRINT:PRINT"CHRISTOPHER C. MARVEL"
120 PRINT:PRINT"              CDPYRIGHT 1980"
130 FDRJ=1TD3000:NEXT
140 DPEN"I",1,"WORLD/DAT","MF",150   'NEWDDSB0 DISK FILE
150 B=01B1=01B2=01S1=01S2=01T=01I=01J=01A0="0"P1$="":P2$="":P3$="":N$=""
160 CLS:PRINT@512,"WHAT IS THE RECDRD # DF THE WORLD YOU WISH TO RETRIEVE"
:!NPUT""!RN
170 GOSUB1660
180 CLS:PRINT@320,"***************** W O R L D   G E N E R A T O R *****
**:**** ***"
190 CLS:PRINT"======PLANET"=========================="!N$!"=========="
200 Y!NIT"STARPORT.....................................";!A1
210 IFA1="A"!PRINT"EXCELLENT. REFINED FUEL. ANNUAL MAINTENANCE. SHIPYARD
CAPABLE OFHANDLING TSTARSHIPS AND NO-STARSHIPS."
220 IFA1="B"PRINT"GDDD. REFINED FUEL. ANNUAL MAINTENANCE. SHIPYARD CAPABLE
OF CONSTRUCTING NON STARSHIPS."
230 IFA1="C"PRINT"RDUTINE. ONLY UNREFINED FUEL AVAILAIBLE. REASONABLE
REPAIR FACILITY PRESENT."
240 IFA1="D"PRINT"PDDR. DNLY UNREFINED FUEL AVAILABLE. NO REPAIR.)
250 IFA1="E"PRINT"FRDNTIER.  NO FUEL DR BASES."
260 IFA1="X"PRINT"NO STARPORT "
270 IFS1=1PRINT"NAVAL BASE PRESENT"
280 IFS2=1PRINT"SCDUT BASE PRESENT"
290 IFA0="1"PRINT"RDSETTE WORLDS (3)"
300 IFA0="2"PRINT"RINGWORLDS"

310 IFA0="3"PRINT"SHPEREWORLDS - ARTIFICIAL ATMDSPHERE"!A5="0"
320 PRINT"PLANETARY SIZE (MILES DIAMETER) ........."!
330 IFA4="0"PRINT"ASTERDID/PLANETOID COMPLEX"
340 IFA4="1"PRINT"1000 "
350 IFA4="2"PRINT"2000 "
360 IFA4="3"PRINT"3000 "
370 IFA4="4"PRINT"4000 "
380 IFA4="5"PRINT"5000 "
390 IFA4="6"PRINT"6000 "
400 IFA4=  7"PRINT"7000 "
410 IFA4="8"PRINT"8000 "
420 IFA4="9"PRINT"9000 "
430 IFA4="A"PRINT"10000 "
440 IFA4="B"PRINT"11000 "
450 IFA4="C"PRINT"12000
460 PRINT"PLANETARY ATMDSPHERE.....................";
470 IFA5="0"PRINT"NDNE"
480 IFA5="1"PRINT"TRACE"
490 IFA5="2"PRINT"VERY THIN,TRINTED"
500 IFA5="3"PRINT"VERY THIN"
510 IFA5="4"PRINT"THIN,TAINTED"
520 IFA5="5"PRINT"THIN"
530 IFA5="6"PRINT"STANDARD"
540 IFA5="7"PRINT"STANDARD,TAINTED"
550 IFA5="8"PRINT"DENSE"
560 IFA5="9"PRINT"DENSE,TAINTED"
570 IFA5="A"PRINT"EXDTIC"
580 IFA5="B"PRINT"CDRRDSIVE
590 IFA5="C"PRINT"INSIDIOUS"
600 PRINT"HYDRDGRAPHIC % ........................."!
610 IFA6="0"PRINT"ND FREE STANDING WATER"
620 IFA6="1"PRINT"10%"
630 IFA6="2"PRINT"20%"
640 IFA6="3"PRINT"30%"
650 IFA6="4"PRINT"40%"
660 IFA6="5"PRINT"50%"
670 IFA6="6"PRINT"60%"
680 IFA6="7"PRINT"70%"
690 IFA6="8"PRINT"80%"
700 IFA6="9"PRINT"90%"
710 IFA6="A"PRINT"ALL WATER. NO LAND MASSES"
720 PRINT"PDPULATIDN.....................";
730 IFA7="0"PRINT"NDNE"
740 IFA7="1"PRINT"10"
750 IFA7="2"PRINT"100"
760 IFA7="3"PRINT"1000"
770 IFA7="4"PRINT"10.000"
780 IFA7="5"PRINT"100.000"
790 IFA7="6"PRINT"1.000.000"
800 IFA7="7"PRINT"10.000.000"
810 IFA7="8"PRINT"100.000.000"
820 IFA7="9"PRINT"1.000.000.000"
830 IFA7="A"PRINT"10.000.000.000"
840 PRINT"GDVERNMENT TYPE.....................................
850 IFA8="0"PRINT"NO GOVERNMENT STRUCTURE. IN MANY CASES, FAMILY BONDS WILL
 PREDDMINATE."
860 IFA8="1"PRINT"COMPANY/CORPDRATION. RULING FUNCTIONS ARE ASSUMED BY A
COMPANY MANAGERIAL ELITE, AND MDST CITZENRY ARE COMPANY EMPLOYEES OR
DEPENDENTS."
870 IFA8="2"PRINT"PARTICIPATING DEMDCRACY. RULING FUNCTION DECISIDNS ARE
REACHED BY ADVICE OF THE CITIZENRY DIRECTLY."
880 IFA8="3"PRINT"SELF PERPETUATING OLIGARCHY. RULING FUNCTIONS ARE
PERFDRMED BY ARESTRICTED MINDRITY, WITH LITTLE OR NO INPUT FRDM THE MASS
OF|CITIZENRY"
890 IFA8="4"PRINT"REPRESENTATIVE DEMOCRACY. RULING FUNCTIONS ARE
PERFORMED BY  ELECTED REPRESENTATIVES."
```

World Reader

November Software Specials

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```
900 IFA8="5"PRINT"FEUDAL TECHNOCRACY, RULING FUNCTIONS ARE PERFORMED BY
SPECIFIC]INDIVIDUALS FOR PERSONS WHO AGREE TO BE RULED BY THEM,
RELATIONSHIPS ARE BASED ON THE PERFORMANCE OF TECHNICAL'ACTIVITIES WHICH
ARE MUTUALLY BENEFICIAL."
910 IFA8="6"PRINT"CAPTIVE GOVERNMENT. RULING FUNCTIONS ARE PERFORMED BY
AN IMPOSED LEADERSHIP FROM AN OUTSIDE GROUP. A COLONY OR CONQUERED AREA."
920 IFA8="7"PRINT"BALKANIZATION.NO CENTRAL RULING AUTHORITY EXISTS! RIVAL
GOVERNMENTS COMPETE FOR CONTROL. LAW LEVEL REFERS TO THE GOVERNMENT NEA
REST THE STARPORT."
930 IFA8="8"PRINT"CIVIL SERVICE  BUREAUCRACY. RULING FUNCTIONS ARE
PERFORMED BY GOVERNMENT AGENCIES EMPLOYING INDIVIDUALS WITH A SELECTED
EXPERTISE."
940 IFA8="9"PRINT"IMPERSONAL BUREAUCRACY. RULING FUNCTIONS ARE PERFORMED
BY AGENCIES WHICH HAVE BECOME INSULATED FROM THE GOVERNED CITIZENRY
950 IFA8="A"PRINT"CHARISMATIC DICTATORSHIP. RULING FUNCTIONS ARE
PERFORMED BY AGENCIES DIRECTED BY A SINGLE LEADER WHO ENJOYS THE
OVERWHELMINGCONFIDENCE OF THE CITIZENRY."
960 IFA8="B"PRINT"NON-CHARISMATIC LEADER. APREVIOUS CHARISMATIC DICTATOR
HAS BEEN REPLACED BY A LEADER THROUGH NORMAL CHANNELS."
970 IFA8="C"PRINT"CHARISMATIC OLIGARCHY. RULING FUNCTIONS ARE PERFORMED
BY A SELECT GROUP OF MEMBERS OF AN ORGANIZATION OR CLASS WHICH ENJOYSTHE
OVERWHELMING CONFIDENCE OM THE CITIZENRY."
980 IFA8="D"PRINT"RELIGIOUS DICTATORSHIP. RULING FUNCTIONS ARE PERFORMED
BY A RELIGIOUS ORGANIZATION WITHOUT REGARD TO THE SPECIFIC NEEDS OF  THE
CITIZENRY.
990 B=VAL(A9):INPUT"ENTER TO CONTINUE"!XX:CLS:PRINT"LAW LEVEL.....
.....
1000 IFB=0PRINT"NO LAWS AFFECTING WEAPON POSSESSION OR WEAPON OWNERSHIP."
1010 IFB=1PRINT"CERTAIN WEAPONS ARE PROHIBITED,INCLUDING SPECIFICALLY
:)BODY PISTOLS WHICH ARE UNDETECTABLE BY STANDARD DETECTORS 2)EXPLOSIVE
WEAPONS SUCH AS  BOMBS OR GRENADES. AND 3) POISON GAS."
1020 IFB=2PRINT"PORTABLE ENERGY WEAPONS. SUCH AS LASER RIFLES OR
CARBINES ARE PROHIBITED. SHIP'S GUNNERY IS NOT AFFECTED"
1030 IFB=3PRINT"WEAPONS OF A STRICT MILITARY NATURE (SUCH AS MACHINE
GUNS OR  AUTOMATIC RIFLES.  THOUGH NOT SUBMACHINEGUNS) ARE PROHIBITED."
1040 INPUT"PRESS ENTER TO CONTINUE";XX
1050 IFB=4PRINT"LIGHT ASSAULT WEAPONS (SUCH AS SUBMACHINE GUNS) ARE
PROHIBITED. "
1060 IFB=5PRINT"PERSONAL CONCEALABLE FIREARMS (SUCH AS PISTOLS AND
REVOLVERS) ARE PROHIBITED."
1070 IFB=6PRINT"MOST FIREARMS  ARE PROHIBITED. THE CARRYINGOF ANY TYPE
OF WEAPON IS DISCOURAGED."
1080 IFB=7PRINT"SHOTGUNS ARE PROHIBITED."
1090 IFB=8PRINT"LONG BLADED WEAPONS !ALL BLADE WEAPONS EXCEPT DAGGERS)
ARE STRICTLY CONTROLLED. OPEN POSSESSION IN PUBLIC IS PROHIBITED.
OWNERSHIP IS.HOWEVER. NOT RESTRICTED."
1100 IFB=9PRINT"POSSESION OF ANY WEAPON OUTSIDE ONE'S HOME IS
PROHIBITED."
1110 INPUT"ENTER TO CONTINUE";XX
1120 CLS:PRINT"TECNOLOGICAL INDEX.....
.....
1130 PRINT"========== WEAPONS ==========
1140 PRINTTAB(0)"PERSONAL";TAB(20);"ARMOR";TAB(30);"SPECIAL";TAB(40)!
"COMPUTERS"  ;TAB(50))"COMMUNICATION"
1150 IFT=0PRINTTAB(0)"CLUB, CUDGEL, SPEAR";TAB(50)"RUNNERS"
1160 IFT=1PRINTTAB(0)"DAGGER,PIKE,SWORD";TAB(20)!"JACK";TAB(30)!"CATAPULT
";TAB(4 0)!"ABACUS";TAB(50)!"HELIOGRAPH"
1170 IFT=2PRINTTAB(0)"HALBRED, BROADSWORD";TAB(30)!"CANNON"
1180 IFT=3PRINTTAB(0)"FOIL,CUTLASS,BLADE"
1190 IFT=3PRINT"BAYONET"
1200 IFT=4PRINTTAB(0)"REVOLVER,SHOTGUN";TAB(20)!"CLOTH";TAB(30)!"ARTIL
LERY";TAB( 40)!"ADDING";TAB(50)!"TELEPHONES"
1210 IFT=4PRINTTAB(40)"MACHINES"
1220 IFT=5PRINTTAB(0)"CARBINE,RIFLE,SMG";TAB(30)!"SANDCASTER";TAB(40)!
"MODEL/1"! TAB(50)!"RADIO"
1230 IFT=5PRINTTAB(0)"PISTOL";TAB(30)!"MORTARS"
1240 IFT=6PRINTTAB(0)"AUTO RIFLE";TAB(30)!"MISSILES";TAB(40)!"MODEL/1BIS"
!TAB(50 )!"TELEVISION"
1250 IFT=7PRINTTAB(0)"BODY PISTOL";TAB(20)!"MESH";TAB(30)!"PULSE LASER";
TAB(40)!" MODEL/2"
1260 IFT=8PRINTTAB(0)"LASER CARBINE";TAB(2B)!"AUTO-CANNON";TAB(40)!"MODEL
/2BIS"
1270 IFT=9PRINTTAB(0)"LASER RIFLE";TAB(20)!"ABLAT";TAB(30)!"BM LASER";TAB
(40)!"MODEL/3"
1280 IFT=10PRINTTAB(20)"REFLEC";TAB(40)!"MODEL/4"
1290 IFT=12PRINTTAB(40)"MODEL/5"
1300 IFT=13PRINTTAB(40)"MODEL/6"
1310 IFT=14PRINTTAB(0)"BATTLE DRESS";TAB(40)!"MODEL/7"
1320 IFT=17PRINTTAB(40)"ARTIFICIAL"
1330 IFT=17PRINTTAB(40)"INTELLIGENCE"
1340 PRINT"==============TRANSPORTATION=============="
1350 PRINTTAB(0)"WATER";TAB(20)!"LAND";TAB(30)!"AIR";TAB(40)!"SPACE";TAB
(50)!"FUELS"
1360 IFT=0PRINTTAB(0)"CANOES";TAB(20)!"CARTS";TAB(50)!"MUSCLE"
1370 IFT=1PRINTTAB(0)"GALLEY";TAB(20)!"WAGON"
1380 IFT=2PRINTTAB(50)"WIND"
1390 IFT=3PRINTTAB(0)"SAILING SHIPS";TAB(30)!"HOT AIR BALLOON";TAB(50)!
"WATER WHEEL"
1400 IFT=4PRINTTAB(0)"STEAMSHIPS";TAB(20)!"TRAINS";TAB(30)!"DIRIGIBLES";
TAB(50)! "COAL"
1410 IFT=5PRINTTAB(20)"GROUND ";TAB(30)!"FIXED ";TAB(50)!"OIL"
1420 IFT=5PRINTTAB(20)"CAR";TAB(30)!"WING"
1430 IFT=6PRINTTAB(0)"SUBMERSIBLES";TAB(20)!"ATV,AFV";TAB(30)!"ROTARY WING"
;TAB( 50)!"FISSION"
1440 IFT=5DRTAB(0)PRINTTAB(30)"AIRCRAFT"
1450 IFT=7PRINTTAB(0)"HOVERCRAFT";TAB(20)!"HOVERCRAFT";TAB(40)!"NON-STAR
SHIP";TAB(53)!"SOLAR"
1460 ' "T=5PRINT"?B-30:"018/90ET";TAB(50);"FUSION"
1470 IFT=9ANDT<(15PRINTTAB(40)"STARSHIPS"
1480 IFT=10PRINTTAB(40)"DRIVE H"
1490 IFT=11PRINTTAB(40)"DRIVE K"
1500 IFT=12PRINTTAB(30)"GRAV BELTS";TAB(40)!"DRIVE N"
1510 IFT=13PRINTTAB(40)"DRIVE O"
1520 IFT=14PRINTTAB(40)"DRIVE U"
1530 IFT>10ANDT<(14PRINTTAB(40)"OR LESS"
1540 IFT=15PRINTTAB(40)"ALL DRIVES"
1550 IFT=16PRINT"********** MATTER TRANSPORT **********"
1560 IFT=17PRINTTAB(50)"ANTI MATTER"
1570 PRINT!INPUT"ENTER TO CONTINUE";XX
1580 CLS:PRINT"PLANET==========================================";N$:PRINT
1590 PRINT"UNIVERSAL PLANET PROFILE.....";A$
1600 PRINT"TECH INDEX";T
1610 PRINT"SPECIAL ADDITIONS"
1620 PRINTP1$;PRINTP2$;PRINTP3$
1630 INPUT"DO YOU WISH TO CONTINUE";AZ$
1640 IF LEFT$(AZ$,1)()"N"THEN150
1650 CLOSE:END
1660 'DISK SAVE
1670 GET 1,RN..N$,A$,P1$,P2$,P3$,S1%,S2%:
1680 A1=LEFT$(A$,1):A4=MID$(A$,2,1):A5=MID$(A$,3,1):A6=MID$(A$,4,1):A7=MID
$(A$,5 ,1):A8=MID$(A$,6,1)
1690 A9=MID$(A$,7,1):TF$=MID$(A$,8,1):A0=RIGHT$(A$,1)
1700 A$=LEFT$(A$,8)
1710 IFTF$="0"T=0                    1810 IFTF$="A"T=10
1720 IFTF$="1"T=1                    1820 IFTF$="B"T=11
1730 IFTF$="2"T=2                    1830 IFTF$="C"T=12
1740 IFTF$="3"T=3                    1840 IFTF$="D"T=13
1750 IFTF$="4"T=4                    1850 IFTF$="E"T=14
1760 IFTF$="5"T=5                    1860 IFTF$="F"T=15
1770 IFTF$="6"T=6                    1870 IFTF$="G"T=16
1780 IFTF$="7"T=7                    1880 IFTF$="H"T=17
1790 IFTF$="8"T=8                    1890 IFTF$="X"T=18
1800 IFTF$="9"T=9                    1900 RETURN
```

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The kit, at a cost of $125, consists of a temperature sensitive transducer, mounted in a glass tube, and an analog/digital interface card which plugs into slot #7 in the Apple.

If desired, the tiny transducer may be ordered without the glass tube, and can thus be used as an implant for various animal physiology experiments. Another probe will be available in the near future which will plug into the existing circuit board, allowing the user to plot voltage.

FEATURES

Digitizes temperature readings, at user selected intervals so that readings can automatically be plotted using a high resolution graphics display. These graphs can be stored on diskette and printed on a high resolution printer at a later date.

Enables a student to see at leisure those temperature plateaus which are easily missed when manually recording and plotting thermometer readings.

SUGGESTED ACTIVITIES

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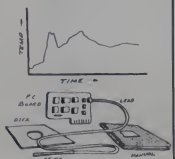
- analyze temperature gradients in snow drifts;



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```
10 'CHARACTER GENERATOR FOR TRAVELLER(TM) - GAME DESIGNER WORKSHOP
20 'BY CHRISTOPHER C. MARVEL COPYRIGHT 1980
30 '1313 BEAUFORT, LARAMIE, WYOMING 82070
40 DEFINT A-X
50 RANDOM
60 CLS:PRINTCHR$(23):PRINT:PRINT"* * + C H A R A C T E R + * *"
70 PRINT"* * + G E N E R A T O R + * *"
80 PRINT:PRINT"**********************************************
******* ":PRINT:PRINT"                BY"
90 PRINT:PRINT"CHRISTOPHER C. MARVEL"
100 PRINT:PRINT"                COPYRIGHT 1980"
110 FORJ=1TO3000:NEXT
120 'MAIN PROGRAM GENERTATION
130 DEF FNA=RND(6)+RND(6)
140 S1=0:S2=0:S3=0:S4=0:S5=0:S6=0:S7=0:S8=0:S9=0:S0=0:W1=0:W2=0:W3=0:W4=0
:W5=0:W 6=0:K1=0:K2=0:K3=0:K4=0:K5=0:K6=0:K7=0:K8=0:K9=0:K0=0:L1=0:L2=0:
L3=0:L4=0:L5=0:L 6=0:L7=0:L8=0:L9=0:L0=0
150 B$=0:F=0:N$=""":P=0:C=0:E=0:B1=0:C1=0:C2'=0:C3'=0:C=0:B=0:D0=0:B2=0:
B3=0:B4=0
160 CLS:PRINTCHR$(23):'INPUT" NAME YOUR CHARACTER"!N$
170 B=FNA:A1=B 'GET BASIC ATTRIBUTES
180 B=FNA:A2=B
190 B=FNA:A3=B
200 B=FNA:A4=B
210 B=FNA:A5=B
220 B=FNA:A6=B
230 GOSUB3140
240 PRINT:INPUT"DO YOU WISH TO ENLIST"!A$ 'ENLIST OR GET DRAFTED''''
250 IFLEFT$(A$,1)()"N"THEN270
260 CLS:PRINT@512,"YOU HAVE BEEN DRAFTED"!FORJ=1TO500:NEXT:B1=0:GOTO300
270 CLS:PRINT"************** ENLISTMENT **************":PRINT:PRINT"1
- NAVY", "2 - ARMY","5 - MERCHANTS"!PRINT"2 - MARINES","4 - SCOUTS","6 -
OTHER"
280 B1=1
290 INPUT"WHAT BRANCH OF SERVICE DO YOU WISH TO APPLY TO"!B$:ONBSGOTO320,
750,115 0,1540,1830,2240
300 B1=0:FORJ=1TO30:CLS:FORI=1TO3:PRINT@530,"....DRAFTED.....":NEXTI:
NEXTJ:B$=R ND(6) 'DRAFT RANDOM GENERATION
310 IFB$=1THEN360ELSEIFB$=2THEN760ELSEIFB$=3THEN1180ELSEIFB$=4THEN1570.
ELSEIFB$=5 THEN1860ELSEIFB$=6THEN2240
320 B=FNA 'NAVY CHARACTER
330 IFA5=)9B=B+2
340 IFA4=)8B=B+1
350 IFB(8PRINT"YOU ARE REJECTED"!FORJ=1TO1000:NEXT:GOTO300
360 CLS:PRINT,"**************** NAVY ****************":PRINT
370 PRINT"YOU HAVE BEEN ACCEPTED......"!B=FNA:IFA4=)7B=B+2
380 E=E+1
390 IFB)4THEN430
400 PRINT"YOU HAVE BEEN KILLED IN STAR BATTLE"
410 INPUT"DO YOU WISH A NEW CHARACTER"!A$:IFLEFT$(A$,1)()"N"THEN120
420 END
430 PRINT"YOU SURVIVE TOUR #"!E"......"
440 IFB1=0THEN520
450 IFC=)1THEN490
460 B=FNA:IFA6=)9B=B+1
470 IFB(10PRINT"YOU ARE NOT ACCEPTED FOR COMMISSIONING":GOTO520
480 C1=1:PRINT"YOU'VE BEEN COMMISSIONED ENSIGN":C=1:GOTO520
490 B=FNA:IFA5=)8B=B+1
500 IFB(8PRINT"YOU'VE BEEN DENIED PROMOTION":GOTO520
510 PRINT"YOU'VE BEEN PROMOTED"!P=1:C=C+1
520 B1=1:I=1
530 IFC=1:I=2
540 IFP=1:I=I+1
550 IFC=1:I=I+1
560 IFC=5A6=A6+1
570 IFC=6A6=A6+1
580 PRINT"YOU HAVE ACQUIRED "!I!" SKILLS"!PRINT"1 - PERSONAL DELEVOPMENT"
,"2 - SERVICE SKILLS"!PRINT"3 - ADVANCED EDUCATION
590 FORJ=1TOI:B=RND(5)+1:GOSUB640:NEXT
600 GOSUB3140
610 INPUT"DO YOU WISH TO REENLIST"!A$:IFLEFT$(A$,1)="N"THEN630
620 B=FNA:IFB=)6THEN360
630 GOTO2500
640 INPUT"WHICH SKILL DO YOU WISH TO DEVELOP"!XX:ONXXGOTO650,680,700
650 IFB=1A1=A1+1ELSEIFB=2A2=A2+1ELSEIFB=3A3=A3+1ELSEIFB=4A6=A6+1ELSEIFB=
5A4=A4+1 ELSEIFB=6A5=A5+1
660 IFB=1PRINT"+STRENGTH"ELSEIFB=2PRINT"+DEXTERITY"ELSEIFB=3PRINT"+ENDUR
ANCE"ELSEIFB=4PRINT"+SOCIAL"ELSEIFB=5PRINT"+INTELLIGENCE"ELSEIFB=6PRINT"
+EDUCATION"
670 RETURN
680 IFB=1S1=S1+1ELSEIFB=2S2=S2+1ELSEIFB=3S3=S3+1ELSEIFB=4S4=S4+1ELSEIFB=5
S5=S5+1 ELSEIFB=6S6=S6+1
690 RETURN
700 IFA5=)8THEN730
710 IFB=1S2=S2+1ELSEIFB=2S0=S0+1ELSEIFB=3K1=K1+1ELSEIFB=4K9=K9+1ELSEIFB=
5S6=S6+1 ELSEIFB=6K2=K2+1
720 RETURN
730 IFB=1K8=K8+1ELSEIFB=2S9=S9+1ELSEIFB=3K9=K9+1ELSEIFB=4L2=L2+1ELSEIFB=
5K0=K0+1 ELSEIFB=6L1=L1+1
740 RETURN
750 B=FNA:IFA4=)8B=B+1 'MARINES CHARACTER
760 IFA1=)8B=B+2
770 IFB(8PRINT"YOU HAVE BEEN REJECTED"!FORI=1TO300:NEXT:GOTO300
780 CLS:PRINT,"****************** MARINES ******************":PRINT
790 PRINT"YOU HAVE BEEN ACCEPTED......"!B=FNA:IFA3=)8B=B+2
800 E=E+1!W4=1
810 IFB)5THEN850
820 PRINT"YOU HAVE BEEN KILLED IN STAR BATTLE"
830 INPUT"DO YOU WISH A NEW CHARACTER"!A$:IFLEFT$(A$,1)()"N"THEN120
840 END
850 PRINT"YOU SURVIVE TOUR #"!E"......"
860 IFB1=0THEN940
870 IFC=)1THEN910
880 B=FNA:IFA5=)7B=B+1
890 IFB(9PRINT"YOU ARE NOT ACCEPTED FOR COMMISSIONING"!GOTO940
900 C1=1:PRINT"YOU'VE BEEN COMMISSIONED LIEUTENANT"!C=1:W3=1:GOTO940
910 B=FNA:IFA6=)8B=B+1
920 IFB(9PRINT"YOU'VE BEEN DENIED PROMOTION"!GOTO940
930 PRINT"YOU'VE BEEN PROMOTED"!P=1:C=C+1
940 B1=1:I=1
950 IFE=1I=2
960 IFP=1I=I+1
970 IFC=1I=I+1
980 PRINT"YOU HAVE ACQUIRED "!I!" SKILLS"!PRINT"1 - PERSONAL DELEVOPMENT",
"2 - SERVICE SKILLS"!PRINT"3 - ADVANCED EDUCATION
990 FORJ=1TOI:B=RND(5)+1:GOSUB1040:NEXT
1000 GOSUB3140
1010 INPUT"DO YOU WISH TO REENLIST"!A$:IFLEFT$(A$,1)="N"THEN1030
1020 B=FNA:IFB=)6THEN780
1030 GOTO2500
1040 INPUT"WHICH SKILL DO YOU WISH TO DEVELOP"!XX:ONXXGOTO1050,1080,1100
1050 IFB=1A1=A1+1ELSEIFB=2A2=A2+1ELSEIFB=3A3=A3+1ELSEIFB=4K5=K5+1ELSEIFB=5
K6=K6+ 1ELSEIFB=6S4=S4+1
1060 IFB=1PRINT"+STRENGTH"ELSEIFB=2PRINT"+DEXTERITY"ELSEIFB=3PRINT"+ENDURANCE"
1070 RETURN
1080 IFB=1S7=S7+1ELSEIFB=2S2=S2+1ELSEIFB=3S4=S4+1ELSEIFB=4S4=S4+1ELSEIFB=5
S5=S5+ 1ELSEIFB=6S5=S5+1
1090 RETURN
1100 IFA5=)8THEN1130
1110 IFB=1S7=S7+1ELSEIFB=2S0=S0+1ELSEIFB=3K1=K1+1ELSEIFB=4L3=L3+1ELSEIFB=
5S4=S4+ 1ELSEIFB=6S5=S5+1
1120 RETURN
```


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1130 IFB=1+8*KB+1ELSEIFB=2*L3+L3+1ELSEIFB=3*L3+L3+1ELSEIFB=4*L2+L2+1ELSEIFB=
5*L4+L4+ 1ELSEIFB=6*L1+L1+1
1140 RETURN
1150 B=FNA1(FA2=)*6B=B+1 'ARMY CHARACTER
1160 IFA3=)*5B=B+2
1170 IFB(5PRINT"YOU HAVE BEEN REJECTED":FORI=1TO300:NEXT:GOTO300
1180 CLS:PRINT,"*************** ARMY ***************":PRINT
1190 PRINT"YOU HAVE BEEN ACCEPTED.....":W5=1:B=FNA1(FA5=)*6B=B+2:E=E+1
1200 IFB)4THEN1240
1210 PRINT"YOU HAVE BEEN KILLED IN STAR BATTLE"
1220 INPUT"DO YOU WISH A NEW CHARACTER":A$:IFLEFT$(A$,1)()"N"THEN120
1230 END
1240 PRINT"YOU SURVIVE TOUR #":1E"....."
1250 IFB1=0THEN1330
1260 IFC=)1THEN1300
1270 B=FNA1(FA3=)*7B=B+1
1280 IFB(5PRINT"YOU ARE NOT ACCEPTED FOR COMMISSINOING":GOTO1330
1290 C1=1:PRINT"YOU'VE BEEN COMMISSIONED LIEUTENANT":W6=1:C=1:GOTO1330
1300 B=FNA1(FA5=)*7B=B+1
1310 IFB(9PRINT"YOU'VE BEEN DENIED PROMOTION":GOTO1330
1320 PRINT"YOU'VE BEEN PROMOTED":P=1:C=C+1
1330 B1=1:I=1
1340 IFE=1:I=2
1350 IFE=1:I=1+1
1360 IFC1=1:I=1+I
1370 PRINT"YOU HAVE ACQUIRED "1I" SKILLS":PRINT"1 - PERSONAL DELEVOPMENT"
,"2 - SERVICE SKILLS":PRINT"3 - ADVANCED EDUCATION
1380 FOR J=1TO1:B=RND(5)+1:GOSUB1430:NEXT
1390 GOSUB3140
1400 INPUT"DO YOU WISH TO REENLIST":A$:IFLEFT$(A$,1)="N"THEN1420
1410 B=FNA1(FB=)*7THEN1180
1420 GOTO2500
1430 INPUT"WHICH SKILL DO YOU WISH TO DEVELOP"1X:ONXXGOTO1440,1470,1490
1440 IFB=1A1=A1+1ELSEIFB=2A2=A2+1ELSEIFB=3A3=A3+1ELSEIFB=4K5=K5+1ELSEIFB=
5K6=K6+ 1ELSEIFB=6A5=A5+1
1450 IFB=1PRINT"+STRENGTH"ELSEIFB=2PRINT"+DEXTERITY"ELSEIFB=3PRINT"+ENDURA
NCE"ELSEIFB=6PRINT"+EDUCATION"
1460 RETURN
1470 IFB=1S7=S7+1ELSEIFB=2S8=S8+1ELSEIFB=3S3=S3+1ELSEIFB=4S4=S4+1ELSEIFB
=5S5=S5+ 1ELSEIFB=6S5=S5+1
1480 RETURN
1490 IFA5=)8THEN1520
1500 IFB=1S7=S7+1ELSEIFB=2S0=S0+1ELSEIFB=3K1=K1+1ELSEIFB=4L3=L3+1ELSEIFB=5
S4=S4+ 1ELSEIFB=6S5=S5+1
1510 RETURN
1520 IFB=1KB+KB+1ELSEIFB=2L3=L3+1ELSEIFB=3L3=L3+1ELSEIFB=4L2=L2+1ELSEIFB=
5L4=L4+ 1ELSEIFB=6L1=L1+1
1530 RETURN
1540 B=FNA1(FA4=)6B=B+1 'SCOUTS CHARACTER
1550 IFA1=)8B=B+2
1560 IFB(7PRINT"YOU HAVE BEEN REJECTED":FORI=1TO300:NEXT:GOTO300
1570 CLS:PRINT,"*************** SCOUTS ***************":PRINT
1580 PRINT"YOU HAVE BEEN ACCEPTED.....":1K0=1:B=FNA1(FA3=)9B=B+2
1590 E=E+1
1600 IFB)6THEN1640
1610 PRINT"YOU HAVE BEEN KILLED IN STAR BATTLE"
1620 INPUT"DO YOU WISH A NEW CHARACTER":A$:IFLEFT$(A$,1)()"N"THEN120
1630 END
1640 PRINT"YOU SURVIVE TOUR #":1E"....."
1650 I=1:IFE=1I=2
1660 PRINT"YOU HAVE ACQUIRED "1I" SKILLS":PRINT"1 - PERSONAL DELEVOPMEN
T","2 - SERVICE SKILLS":PRINT"3 - ADVANCED EDUCATION
1670 FORJ=1TOI:B=RND(5)+1:GOSUB1720:NEXT
1680 GOSUB3140
1690 INPUT"DO YOU WISH TO REENLIST":A$:IFLEFT$(A$,1)="N"THEN1710
1700 B=FNA1(FB=)3THEN1570
1710 GOTO2500
1720 INPUT"WHICH SKILL DO YOU WISH TO DEVELOP"1X:ONXXGOTO1730,1760,1780
1730 IFB=1A1=A1+1ELSEIFB=2A2=A2+1ELSEIFB=3A3=A3+1ELSEIFB=4S5=S5+1ELSEIFB=5A
4=A4+1ELSEIFB=6A5=A5+1
1740 IFB=1PRINT"+STRENGTH"ELSEIFB=2PRINT"+DEXTERITY"ELSEIFB=3PRINT"+ENDU
RANCE"ELSEIFB=5PRINT"+INTELLIGENCE"ELSEIFB=6PRINT"+EDUCATION"
1750 RETURN
1760 IFB=1S8=S8+1ELSEIFB=2S2=S2+1ELSEIFB=3S9=S9+1ELSEIFB=4S8=S8+1ELSEIFB
=5K1=K1+ 1ELSEIFB=6K2=K2+1
1770 RETURN
1780 IFA5=)8THEN1810
1790 IFB=1S8=S8+1ELSEIFB=2S0=S0+1ELSEIFB=3K1=K1+1ELSEIFB=4K2=K2+1ELSEIFB
=5S6=S6+ 1ELSEIFB=6K8=K8+1
1800 RETURN
1810 IFB=1K8=K8+1ELSEIFB=2S9=S9+1ELSEIFB=3K9=K9+1ELSEIFB=4L2=L2+1ELSEIFB
=5K0=K0+ 1ELSEIFB=6K2=K2+1
1820 RETURN
1830 B=FNA1(FA1=)7B=B+1 'MERCHANTS CHARACTER
1840 IFA4=)6B=B+2
1850 IFB(7PRINT"YOU HAVE BEEN REJECTED":FORI=1TO300:NEXT:GOTO300
1860 CLS:PRINT,"*************** MERCHANTS ***************":PRINT
1870 PRINT"YOU HAVE BEEN ACCEPTED.....":B=FNA1(FA4=)7B=B+2
1880 E=E+1
1890 IFB)6THEN1930
1900 PRINT"YOU HAVE BEEN KILLED IN STAR BATTLE"
1910 INPUT"DO YOU WISH A NEW CHARACTER":A$:IFLEFT$(A$,1)()"N"THEN120
1920 END
1930 PRINT"YOU SURVIVE TOUR #":1E"....."
1940 IFB1=0THEN2020
1950 IFC=)1THEN1990
1960 B=FNA1(FA4=)6B=B+1
1970 IFB(6PRINT"YOU ARE NOT ACCEPTED FOR COMMISSINOING":GOTO2020
1980 C1=1:PRINT"YOU'VE BEEN COMMISSIONED 4TH OFFICER":C=1:GOTO2020
1990 B=FNA1(FA4=)9B=B+1
2000 IFB(10PRINT"YOU'VE BEEN DENIED PROMOTION":GOTO2020
2010 PRINT"YOU'VE BEEN PROMOTED":P=1:C=C+1
2020 B1=1I=1
2030 IFE=1I=2
2040 IFP=1I=I+1
2050 IFC1=1I=1+1
2060 IFC1=4K0=K0+1
2070 PRINT"YOU HAVE ACQUIRED "1I" SKILLS":PRINT"1 - PERSONAL DELEVOPMENT
","2 - SERVICE SKILLS":PRINT"3 - ADVANCED EDUCATION
2080 FORJ=1TOI:B=RND(5)+1:GOSUB2130:NEXT
2090 GOSUB3140
2100 INPUT"DO YOU WISH TO REENLIST":A$:IFLEFT$(A$,1)="N"THEN2120
2110 B=FNA1(FB=)4THEN1860
2120 GOTO2500
2130 INPUT"WHICH SKILL DO YOU WISH TO DEVELOP"1X:ONXXGOTO2140,2170,2190
2140 IFB=1A1=A1+1ELSEIFB=2A2=A2+1ELSEIFB=3A3=A3+1ELSEIFB=4A1=A1+1ELSEIF
B=5S4=S4+ 1ELSEIFB=6K7=K7+1
2150 IFB=1ORB=4PRINT"+STRENGTH"ELSEIFB=2PRINT"+DEXTERITY"ELSEIFB=3PRINT"
+ENDURAN CE"
2160 RETURN
2170 IFB=1K3=K3+1ELSEIFB=2S2=S2+1ELSEIFB=3A1=A1+1ELSEIFB=4S5=S5+1ELSEIFB
=5K1=K1+ 1ELSEIFB=6K2=K2+1
2180 RETURN
2190 IFA5=)8THEN2220
2200 IFB=1L5=L5+1ELSEIFB=2S0=S0+1ELSEIFB=3K1=K1+1ELSEIFB=4S9=S9+1ELSEIFB
=5S6=S6+ 1ELSEIFB=6K8=K8+1
2210 RETURN
2220 IFB=1KB+KB+1ELSEIFB=2S9=S9+1ELSEIFB=3K9=K9+1ELSEIFB=4L2=L2+1ELSEIF
B=5K0=K0+ 1ELSEIFB=6L1=L1+1
2230 RETURN
2240 CLS:PRINT,"*************** OTHER ***************":PRINT'OTHER
CHARACTER
2250 PRINT"YOU HAVE BEEN ACCEPTED.....":B=FNA1(FA4=)9B=B+2
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```
2260 E=E+1
2270 IFB)4THEN2310
2280 PRINT"YOU HAVE BEEN KILLED IN STAR BATTLE"
2290 INPUT"DO YOU WISH A NEW CHARACTER"!A$:IFLEFT$(A$,1)()"N"THEN120
2300 END
2310 PRINT"YOU SURVIVE TOUR #"!E"....."
2320 I=1!IFE=11I=2
2330 PRINT"YOU HAVE ACQUIRED "!I!" SKILLS":PRINT"1 - PERSONAL DELEVOPMENT
","2 - SERVICE SKILLS":PRINT"3 - ADVANCED EDUCATION"
2340 FORJ=1TOI:B=RND(5)+1:GOSUB2390:NEXT
2350 GOSUB3140
2360 INPUT"DO YOU WISH TO REENLIST"!A$:IFLEFT$(A$,1)="N"THEN2380
2370 B=FNA1!FB)=5THEN2240
2380 GOTO2500
2390 INPUT"WHICH SKILL DO YOU WISH TO DEVELOP"!XX:ONXXGOTO2400,2A30,2450
2400 IFB=1A1=A1+1ELSEIFB=2A2=A2+1ELSEIFB=3A3=A3+1ELSEIFB=4S4=S4+1ELSEIFB=
5K6=K6+ 1ELSEIFB=6A6=A6+1
2410 IFB=1PRINT"+STRENGTH"ELSEIFB=2PRINT"+DEXTERITY"ELSEIFB=3PRINT"+ENDUR
ANCE"ELSEIFB=6PRINT"-SOCIAL"
2420 RETURN
2430 IFB=1K4=K4+1ELSEIFB=2K5=K5+1ELSEIFB=3K6=K6+1ELSEIFB=4S4=S4+1ELSEIFB=
5S5=S5+ 1ELSEIFB=6K7=K7+1
2440 RETURN
2450 IFA5=)5THEN2480
2460 IFB=1L5=L5+1ELSEIFB=2S0=S0+1ELSEIFB=3K1=K1+1ELSEIFB=4K5=K5+1ELSEIFB=
5K6=K6+ 1ELSEIFB=6K4=K4+1
2470 RETURN
2480 IFB=1K8=K8+1ELSEIFB=2K4=K4+1ELSEIFB=3K1=K1+1ELSEIFB=4L2=L2+1ELSEIFB=
5L5=L5+ 1ELSEIFB=6K2=K2+1
2490 RETURN
2500 CLS:PRINT"YOU ARE MUSTERED OUT........"
2510 T=1+E:IFC=1 OR C=2 T=T+1
2520 IFD)2T=T+2
2530 IFB$=1THEN2540ELSEIFB$=2THEN2630ELSEIFB$=3THEN2720ELSEIFB$=4THEN2810
ELSEIFB S=5THEN2900ELSEIFB$=6THEN2990 'MUSTER OUT BENEFITS FOR EACH BRANCH
OF SERVICE
2540 FORJ=1TOT:GOSUB2550:C3'=C3'+C2':NEXT:GOSUB3000:GOSUB3140:FORI=1TO1500
!NEXT: GOTO4030 'ARMY
2550 INPUT"WHICH BENEFIT (1 - MATERIALS, 2 - CASH ALLOWANCE)"!XX
2560 ONXXGOTO 2570,2600
2570 B=RND(6)!IFC)AB=B+1
2580 IFB=1L6=L6+1ELSEIFB=2A6=A6+1ELSEIFB=3A5=A5+2ELSEIFB=4W1=W1+1ELSEIFB=
5LB=1ELSEIFB=6L7=L7+1ELSEIFB=7A6=A6+2
2590 RETURN
2600 B=RND(6)!IFC)AB=B+1
2610 IFB=1C2'=.001ELSEIFB=2ORB=3C2'=.005ELSEIFB=4C2'=.01ELSEIFB=5C2'=
.02ELSEIFB=])6C2'=.05
2620 RETURN
2630 FORJ=1TOT:GOSUB2640:C3'=C3'+C2':NEXT:GOSUB3080:GOSUB3140:FORI=1TO1500
!NEXT: GOTO4030 'MARINES
2640 INPUT"WHICH BENEFIT (1 - MATERIALS, 2 - CASH ALLOWANCE)"!XX
2650 ONXXGOTO 2660,2690
2660 B=RND(6)!IFC)AB=B+1
2670 IFB=1L6=L6+1ELSEIFB=2A6=A6+2ELSEIFB=3A5=A5+1ELSEIFB=4W1=W1+1ELSEIFB=
5LB=LBE LSEIFB=6L7=L7+1ELSEIFB=7A6=A6+2
2680 RETURN
2690 B=RND(6)!IFC)AB=B+1
2700 IFB=1C2'=.002ELSEIFB=2ORB=3C2'=.005ELSEIFB=4C2'=.01ELSEIFB=5C2'=
.02ELSEIFB= 6C2'=.05ELSEIFB=7C2'=.04
2710 RETURN
2720 FORJ=1TOT:GOSUB2730:C3'=C3'+C2':NEXT:GOSUB3080:GOSUB3140:FORI=1T01500:
NEXT: GOTO4030 'NAVY
2730 INPUT"WHICH BENEFIT (1 - MATERIALS, 2 - CASH ALLOWANCE)"!XX
2740 ONXXGOTO 2750,2780
2750 B=RND(6)!IFC)AB=B+1
2760 IFB=1L6=L6+1ELSEIFB=2A6=A6+1ELSEIFB=3A5=A5+2ELSEIFB=4W2=W2+1ELSEIFB=
5L7=L7+ 1ELSEIFB=6L8=L8+1ELSEIFB=7A6=A6+1
2770 RETURN
2780 B=RND(6)!IFC)AB=B+1
2790 IFB=1C2'=.002ELSEIFB=2C2'=.005ELSEIFB=3ORB=4ORB=5C2'=.005ELSEIFB=6C2'
=.02EL SEIFB=7C2'=.03
2800 RETURN
2810 FORJ=1TOT:GOSUB2820:C3'=C3'+C2':NEXT:GOSUB3080:GOSUB3140:FORI=1TO1500:
NEXT: GOTO4030 'SCOUTS
2820 INPUT"WHICH BENEFIT (1 - MATERIALS, 2 - CASH ALLOWANCE)"!XX
2830 ONXXGOTO 2840,2870
2840 B=RND(6)!IFC)AB=B+1
2850 IFB=1L6=L6+1ELSEIFB=2A6=A6+2ELSEIFB=3A5=A5+2ELSEIFB=4W1=W1+1ELSEIFB
=5W2=W2+ 1ELSEIFB=6G0=G0+1
2860 RETURN
2870 B=RND(6)!IFC)AB=B+1
2880 IFB=1C2C2'=.02ELSEIFB=3ORB=4C2'=.03ELSEIFB=)5C2'=.05
2890 RETURN
2900 FORJ=1TOT:GOSUB2910:C3'=C3'+C2':NEXT:GOSUB3080:GOSUB3140:FORI=1TO1500:
NEXT: GOTO4030 'MERCHANTS
2910 INPUT"WHICH BENEFIT (1 - MATERIALS, 2 - CASH ALLOWANCE)"!XX
2920 ONXXGOTO 2930,2960
2930 B=RND(6)!IFC)AB=B+1
2940 IFB=1L6=L6+1ELSEIFB=2A6=A6+1ELSEIFB=3A5=A5+1ELSEIFB=4W2=W2+1ELSEIFB
=5W1=W1+ 1ELSEIFB=6L6=L6+1ELSEIFB=7L9=L9+1
2950 RETURN
2960 B=RND(6)!IFC)AB=B+1
2970 IFB=1C2'=.001ELSEIFB=2C2'=.005ELSEIFB=3C2'=.01ELSEIFB=4ORB=5C2'=.
02ELSEIFB= )6C2'=.04
2980 RETURN
2990 FORJ=1TOT:GOSUB3000:C3'=C3'+C2':NEXT:GOSUB3080:GOSUB3140:FORI=1TO1500
:NEXT: GOTO4030 'OTHER SERVICE
3000 INPUT"WHICH BENEFIT (1 - MATERIALS, 2 - CASH ALLOWANCE)"!XX
3010 ONXXGOTO 3020,3050
3020 B=RND(6)!IFC)AB=B+1
3030 IFB=1L6=L6+1ELSEIFB=2A6=A6+1ELSEIFB=3A5=A5+1ELSEIFB=4W2=W2+1ELSEIFB
=5L7=L7+ 1
3040 RETURN
3050 B=RND(6)!IFC)AB=B+1
3060 IFB=1C2'=.001ELSEIFB=2C2'=.005ELSEIFB=)3ANDB=(5C2'=.01ELSEIFB=5C2'
=.05ELSEI FB=7C2'=.1
3070 RETURN
3080 IFE=)5PRINT"RETIREMENT PAY........" 'RETIREMENT PAY
3090 IFE=5PRINT"4000 CR/ANNUM"
3100 IFE=6PRINT"6000 CR/ANNUM"
3110 IFE=7PRINT"8000 CR/ANNUM"
3120 IFE=8 PRINT"10000 CR/ANNUM"
3130 RETURN
3140 CLS:PRINTTAB(4)"******** TRAVELER CHARACTER ********"!PRINT
'DISPLAY CURRENT STATUS OF CHARACTER
3150 NZ$="":IFA6=(10NZ$=N$
3160 IFA6=11NZ$="SIR "+N$
3170 IFA6=12NZ$="BARON "+N$
3180 IFA6=13NZ$="MARQUIS "+N$
3190 IFA6=14NZ$="COUNT "+N$
3200 IFA6=15NZ$="DUKE "+N$
3210 PRINTTAB(0)"NAME.....":NZ$!TAB(25)"RANK....."!C
3220 IFBS)0PRINT"BRANCH OF SERVICE"
3230 IFBS=1PRINT,"NAVY"
3240 IFBS=2PRINT,"MARINES"
3250 IFBS=3PRINT,"ARMY"
3260 IFBS=4PRINT,"SCOUTS"
3270 IFBS=5PRINT,"MERCHANT"
3280 IFBS=6PRINT,"OTHER"
3290 PRINT
3300 P=81:C1=0!A7=1B+4+E
3310 IFA1=)15A1=15
3320 IFA2=)15A2=15
```

```
3330 IFA3=)15A3=15
3340 IFA4=)15A4=15
3350 IFA5=)15A5=15
3360 IFA6=)15A6=15
3370 IFA7(34THEN3590
3380 IFA7=)66THEN7470
3390 IFA7=)46THEN3520
3400 B=FNA
3410 IFB(7A1=A1-1
3420 IFB(7A2=A2-1
3430 IFB(7A3=A3-1:GOTO3590
3440 IfB(8A1=A1-1
3450 IFB(8A3=A3-1
3460 GOTO3590
3470 B=FNA
3480 IFB(9A1=A1-2
3490 IFB(9A2=A2-2                3540 IFB(8A1=A1-1
3500 IFB(9A3=A3-2                3550 IFB(8A2=A2-1
3510 IFB(9A4=A4-4                3560 IFB(8A3=A3-1:GOTO3590
3520 GOTO3590                    3570 IFB(9A1=A1-1
3530 B=FNA                       3580 IFB(9A3=A3-1

3590 PRINTTAB(0)"STRENGTH  - "iA1;TAB(25)"INTELLIGENCE    - "iA4
3600 PRINTTAB(0)"DEXTERITY - "iA2;TAB(25)"EDUCATION       - "iA5
3610 PRINTTAB(0)"ENDURANCE - "iA3;TAB(25)"SOCIAL STANDING - "iA6
3620 PRINT"CURRENT AGE....."iA7
3630 PRINT"SPECIAL SKILLS.....","LEVEL"
3640 IFS1=)1PRINT,"SHIP'S BOAT",,S1
3650 IFS2=)1PRINT,"VAC SUIT",,S2
3660 IFS3=)1PRINT,"FWD OBS",,S3
3670 IFS4=)1PRINT,"BLADE CBT",,S4
3680 IFS5=)1PRINT,"GUN CBT",,S5
3690 IFS6=)1PRINT,"GUNNERY",,S6
3700 IFS7=)1PRINT,"ATV",,S7
3710 IFS8=)1PRINT,"AIR RAFT",,S8
3720 IFS9=)1PRINT,"NAVIGATION",,S9
3730 IFS0=)1PRINT,"MECHANICAL",,S0
3740 IFK1=)1PRINT,"ELECTRONIC",,K1
3750 IFK2=)1PRINT,"JACK/ALL TRADES",,K2
3760 IFK3=)1PRINT,"STEWARD",,K3
3770 IFK4=)1PRINT,"FORGERY",,K4
3780 IFK5=)1PRINT,"GAMBLING",,K5
3790 IFK6=)1PRINT,"BRAWLING",,K6
3800 IFK7=)1PRINT,"BRIBERY",,K7
3810 IFK8=)1PRINT,"MEDICAL",,K8
3820 IFK9=)1PRINT,"ENGINEERING",,K9
3830 IFK0=)1PRINT,"PILOT",,K0
3840 IFL1=)1PRINT,"ADMINISTRATION",,L1
3850 IFL2=)1PRINT,"COMPUTER",,L2
3860 IFL3=)1PRINT,"TACTICS",,L3
3870 IFL4=)1PRINT,"LEADER",,L4
3880 IFL5=)1PRINT,"STREETWISE",,L5
3890 IFL6=)1PRINT,"LOW PASSAGE",,L6
3900 IFL7=)1PRINT,"HIGH PASSAGE",,L7
3910 IFL8=)1PRINT,"TRAVELER'S AID SOCIETY"
3920 IFL9=)1PRINT,"MERCHANT SHIP",,L9
3930 IFL0=)1PRINT,"MID PASSAGE",,L0
3940 IFW1=)1PRINT,"BLADE",,W1
3950 IFW2=)1PRINT,"GUN",,W2
3960 IFW3=)1PRINT,"REVOLVER",,W3
3970 IFW4=)1PRINT,"CUTLASS",,W4
3980 IFW5=)1PRINT,"RIFLE",,W5
3990 IFW6=)1PRINT,"SMG",,W6
4000 IF00=)1PRINT,"SCOUT SHIP",,D0
4010 IFC3')@PRINT"TOTAL CASH DISBURSEMENTS ...."iC3'1" MIL. CR
4020 RETURN

4030 CLS:PRINT@512," "iINPUT"WOULD YOU LIKE A HARD COPY OF YOUR CHARACTER"iY$:IF
LEFT$(Y$,1)()"Y"THEN4630 'PRINT CHARACTER SUMMARY
4040 CLS:LPRINT"*************************************************************
"iLPRINTTAB(20)"T R A V E L L E R    C H A R A C T E R":LPRINT "LPRINT
"*************************************************************"
4050 NZ$=""IFA6=(10NZ$=N$
4060 IFA6=11NZ$="SIR "+N$
4070 IFA6=12NZ$="BARON "+N$
4080 IFA6=13NZ$="MARQUIS "+N$
4090 IFA6=14NZ$="COUNT "+N$
4100 IFA6=15NZ$="DUKE "+N$
4110 LPRINT" "LPRINTTAB(0)"NAME....."iNZ$;TAB(35)"RANK....."iC1
LPRINT" "LPRINT"*************************************************
**********"
4120 IFB5)@LPRINT"BRANCH OF SERVICE"
4130 IFB5=1LPRINT,"NAVY"
4140 IFB5=2LPRINT,"MARINES"
4150 IFB5=3LPRINT,"ARMY"
4160 IFB5=4LPRINT,"SCOUTS"
4170 IFB5=5LPRINT,"MERCHANT"
4180 IFB5=6LPRINT,"OTHER"
4190 LPRINT" "
4200 LPRINTTAB(0)"STRENGTH  - "iA1;TAB(35)"INTELLIGENCE    - "iA4
4210 LPRINTTAB(0)"DEXTERITY - "iA2;TAB(35)"EDUCATION       - "iA5
4220 LPRINTTAB(0)"ENDURANCE - "iA3;TAB(35)"SOCIAL STANDING - "iA6
4230 LPRINT"CURRENT AGE....."iA7:LPRINT" "
4240 LPRINT"SPECIAL SKILLS.....","LEVEL"
4250 IFS1=)1LPRINT,"SHIP'S BOAT",,S1
4260 IFS2=)1LPRINT,"VAC SUIT",,S2
4270 IFS3=)1LPRINT,"FWD OBS",,S3
4280 IFS4=)1LPRINT,"BLADE CBT",,S4
4290 IFS5=)1LPRINT,"GUN CBT",,S5
4300 IFS6=)1LPRINT,"GUNNERY",,S6
4310 IFS7=)1LPRINT,"ATV",,S7
4320 IFS8=)1LPRINT,"AIR RAFT",,S8
4330 IFS9=)1LPRINT,"NAVIGATION",,S9
4340 IFS0=)1LPRINT,"MECHANICAL",,S0
4350 IFK1=)1LPRINT,"ELECTRONIC",,K1
4360 IFK2=)1LPRINT,"JACK/ALL TRADES",,K2
4370 IFK3=)1LPRINT,"STEWARD",,K3
4380 IFK4=)1LPRINT,"FORGERY",,K4
4390 IFK5=)1LPRINT,"GAMBLING",,K5
4400 IFK6=)1LPRINT,"BRAWLING",,K6
4410 IFK7=)1LPRINT,"BRIBERY",,K7
4420 IFK8=)1LPRINT,"MEDICAL",,K8
4430 IFK9=)1LPRINT,"ENGINEERING",,K9
4440 IFK0=)1LPRINT,"PILOT",,K0
4450 IFL1=)1LPRINT,"ADMINISTRATION",,L1
4460 IFL2=)1LPRINT,"COMPUTER",,L2
4470 IFL3=)1LPRINT,"TACTICS",,L3
4480 IFL4=)1LPRINT,"LEADER",,L4
4490 IFL5=)1LPRINT,"STREETWISE",,L5
4500 IFL6=)1LPRINT,"LOW PASSAGE",,L6
4510 IFL7=)1LPRINT,"HIGH PASSAGE",,L7
4520 IFL8=)1LPRINT,"TRAVELER'S AID SOCIETY"
4530 IFL9=)1LPRINT,"MERCHANT SHIP",,L9
4540 IFL0=)1LPRINT,"MID PASSAGE",,L0
4550 IFW1=)1LPRINT,"BLADE",,W1
4560 IFW2=)1LPRINT,"GUN",,W2
4570 IFW3=)1LPRINT,"REVOLVER",,W3
4580 IFW4=)1LPRINT,"CUTLASS",,W4
4590 IFW5=)1LPRINT,"RIFLE",,W5
4600 IFW6=)1LPRINT,"SMG",,W6
4610 IF00=)1LPRINT,"SCOUT SHIP",,D0
4620 LPRINT" "iIFC3')@LPRINT"TOTAL CASH DISBURSEMENTS ...."iC3'1" MILLION
CREDITS"
4630 CLS: PRINT@512," "iINPUT"DO YOU WISH ANOTHER CHARACTER"iY$:IFLEFT$
(Y$,1)="Y "THEN1_0ELSEEND
```

```
---------- SAMPLE RUN - WORLD/BAS

*  *  *  *  *  W  O  R  L  D  *  *  *  *  *
*  *  *  G  E  N  E  R  A  T  O  R  *  *  *

* * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * * * * * * * * * *

GENERATE 1 - WORLDS OR 2 - JUMPS FOR PLANETS
? 1
DO YOU WISH TO GENERATE AN ENTIRELY NEW GALAXY ? Y_

****************** W O R L D   G E N E R A T O R ***************

NAME PLANET? OMICRON 4_

======PLANET=====================OMICRON 4========
STARPORT.....................................................B
GOOD. REFINED FUEL. ANNUAL MAINTENANCE. SHIPYARD CAPABLE OF
CONSTRUCTING NON STARSHIPS.
NAVAL BASE PRESENT
PLANETARY SIZE (MILES DIAMETER) .....6000
PLANETARY ATMOSPHERE.....VERY THIN.TAINTED
HYDROGRAPHIC % .....50%
POPULATION.....1.000.000
GOVERNMENT TYPE.....
CAPTIVE GOVERNMENT. RULING FUNCTIONS ARE PERFORMED BY AN IMPOSED
 LEADERSHIP FROM AN OUTSIDE GROUP. A COLONY OR CONQUERED AREA.
ENTER TO CONTINUE? _

LAW LEVEL.....
CERTAIN WEAPONS ARE PROHIBITED.INCLUDING SPECIFICALLY 1)BODY
PISTOLS WHICH ARE UNDETECTABLE BY STANDARD DETECTORS 2)EXPLOSIVE
WEAPONS SUCH AS BOMBS OR GRENADES, AND 3) POISON GAS,
PORTABLE ENERGY WEAPONS. SUCH AS LASER RIFLES OR CARBINES ARE
PROHIBITED. SHIP'S GUNNERY IS NOT AFFECTED
WEAPONS OF A STRICT MILITARY NATURE (SUCH AS MACHINE GUNS OR
AUTOMATIC RIFLES. THOUGH NOT SUBMACHINEGUNS) ARE PROHIBITED.
PRESS ENTER TO CONTINUE? _

TECNOLOGICAL INDEX.....
========== WEAPONS ==========
PERSONAL          ARMOR     SPECIAL   COMPUTERS COMMUNICATION
LASER RIFLE       ABLAT     BM LASER  MODEL/3
==============TRANSPORTATION==================
WATER             LAND      AIR       SPACE     FUELS
                                      STARSHIPS

REFEREE MAY ADD TO ANY BLANK LINES
DO YOU WISH TO ADD? _

PLANET=======================================OMICRON 4

UNIVERSAL PLANET PROFILE.....B6256659
TECH INDEX 9
SPECIAL ADDITIONS

DO YOU WISH TO STORE DATA? _
```

```
---------- SAMPLE RUN - WDREAD/BAS

*  *  *  *  *  W  O  R  L  D  *  *  *  *  *
*  *  *  *  *  R  E  A  D  E  R  *  *  *  *

* * * * * * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * * * * * * * * * *

WHAT IS THE RECORD # OF THE WORLD YOU WISH TO RETRIEVE? 2_

======PLANET=====================DICRON 7========
STARPORT.....................................................C
ROUTINE, ONLY UNREFINED FUEL AVAILABLE. REASONABLE REPAIR
FACILITY PRESENT.
PLANETARY SIZE (MILES DIAMETER) .....12000
PLANETARY ATMOSPHERE.....DENSE
HYDROGRAPHIC % .....NO FREE STANDING WATER
POPULATION.....1000
GOVERNMENT TYPE.....
PARTICIPATING DEMOCRACY. RULING FUNCTION DECISIONS ARE REACHED
BY ADVICE OF THE CITIZENRY DIRECTLY.
ENTER TO CONTINUE? _

LAW LEVEL.....
CERTAIN WEAPONS ARE PROHIBITED.INCLUDING SPECIFICALLY 1)BODY
PISTOLS WHICH ARE UNDETECTABLE BY STANDARD DETECTORS 2)EXPLOSIVE
WEAPONS SUCH AS BOMBS OR GRENADES, AND 3) POISON GAS,
PORTABLE ENERGY WEAPONS. SUCH AS LASER RIFLES OR CARBINES ARE
PROHIBITED. SHIP'S GUNNERY IS NOT AFFECTED
WEAPONS OF A STRICT MILITARY NATURE (SUCH AS MACHINE GUNS OR
AUTOMATIC RIFLES. THOUGH NOT SUBMACHINEGUNS) ARE PROHIBITED.
PRESS ENTER TO CONTINUE?
LIGHT ASSAULT WEAPONS (SUCH AS SUBMACHINE GUNS) ARE PROHIBITED.
PERSONAL CONCEALABLE FIREARMS (SUCH AS PISTOLS AND REVOLVERS)
ARE PROHIBITED.
ENTER TO CONTINUE? _

TECNOLOGICAL INDEX.....
========== WEAPONS ==========
PERSONAL          ARMOR     SPECIAL   COMPUTERS COMMUNICATION
BODY PISTOL       MESH      PULSE LASER MODEL/2
==============TRANSPORTATION==================
WATER             LAND      AIR       SPACE     FUELS
HOVERCRAFT        HOVERCRAFT          NON-STARSHIP SOLAR

ENTER TO CONTINUE? _

PLANET=======================================DICRON 7

UNIVERSAL PLANET PROFILE.....CC803257
TECH INDEX 7
SPECIAL ADDITIONS

DO YOU WISH TO CONTINUE? NO_
```

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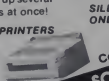

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Real Estate Analyzer,Howardsoft	125/Reg	150
Creative Financing, Howardsoft	125/Reg.	150
ASCII Express II by SDS	55/Reg	65
Z-TERM (CPM) (16 sector)	85/Reg.	100

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CIRCLE 257 ON READER SERVICE CARD

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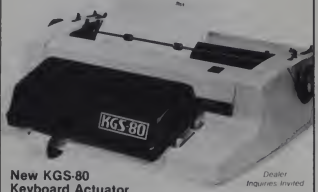

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NIK International Trading Inc.

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CIRCLE 176 ON READER SERVICE CARD

Traveller, continued...

```
---------- SAMPLE RUN - TRAVEL/BAS

*  *  *  C  H  A  R  A  C  T  E  R  *  *
*  *  *  G  E  N  E  R  A  T  O  R  *  *

* * * * * * * * * * * * * * * * * * * * * * * *
* * * * * * * * * * * * * * * * * * * * * * * * *

   N A M E   Y O U R   C H A R A C T E R ?  T H O R_


      ********* TRAVELER CHARACTER *********

NAME.....THOR          RANK..... 0

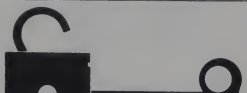
STRENGTH  -  3         INTELLIGENCE    -  12
DEXTERITY -  10        EDUCATION       -  4
ENDURANCE -  11        SOCIAL STANDING -  8
CURRENT AGE..... 18
SPECIAL SKILLS.....                          LEVEL

DO YOU WISH TO ENLIST? YES_



***************** MERCHANTS *****************

YOU HAVE BEEN ACCEPTED.....
YOU SURVIVE TOUR # 1 .....
YOU'VE BEEN COMMISSIONED 4TH OFFICER
YOU HAVE ACQUIRED  3  SKILLS
1 - PERSONAL DEVELOPMENT          2 - SERVICE SKILLS
3 - ADVANCED EDUCATION
WHICH SKILL DO YOU WISH TO DEVELOP? 1
+STRENGTH
WHICH SKILL DO YOU WISH TO DEVELOP? 2
WHICH SKILL DO YOU WISH TO DEVELOP? 3_
```

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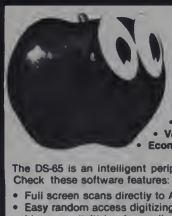

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Building a Better INPUT

Jonathan D. Ashwell

We sometimes receive letters from readers criticizing our use of articles and programs for specific computers. We feel, however, that there is often value in reading articles—and even programs—about computers other than one's own. Here is an example of what an Apple owner did with information found in an article about the Sorcerer. —EBS

One of the advantages of a high level language like Basic is the ease with which one can write interactive programs. The INPUT command is particularly useful, because it provides two functions: the ability to display questions and the means of accepting the response. However, the price one pays for this convenience is in the restrictions imposed upon the format the material to be input must take. This is especially true with strings.

This problem was stated nicely by David Persuitte in the February, 1981 issue of *Creative Computing*. When entering a string, the punctuation marks, comma and colon, are interpreted as "end-of-string" indicators, and any data following them will be ignored. You will be notified of this misunderstanding with the terse ?EXTRA IGNORED. This problem can be avoided by placing the material to be input in quotes, but this is a nuisance.

Moreover, if you are writing a program to be used by others, this sort of restriction is unacceptable. There is also a restriction in that the quote mark cannot be part of a string, since the computer will interpret it as a direction. These restrictions make it impossible to enter true prose into the computer with the INPUT command, for without adequate punctuation, sentences are difficult, if not impossible, to read.

In his article, Mr. Persuitte gives a simple and effective solution to this problem. He uses a short machine language routine written for the Exidy Sorcerer to enter characters (ASCII encoded) from the keyboard to a location in memory, from which they can be reassembled into a string by a series of PEEKs from a Basic language program. Although this works well, it has one major drawback. That is, one loses all of the editing features the computer provides.

As anyone who spends a lot of time in front of a monitor (or TV) knows, this can be quite a sacrifice. I use an Apple II Plus, which provides a backspace (shift rub), retype key (forward arrow) and a variety of pure cursor moves in the ESCAPE mode. Editing input is much more difficult without them.

Although it is possible to build screen editing features back into a routine such as the one described by Mr. Persuitte, it requires a thorough knowledge of the computer monitor routines and adds a lot of dead weight to the program.

I became interested in finding an alternative method of entering data because I wanted to write a program which called for the user to supply information as prose. All punctuation has to be allowed. Editing had to be easy to allow correction of typos and rearrangement of words without retyping a paragraph. There had to be another way to input, without the restrictions so far discussed—and, of course, there is.

The input routine that I devised is a simple adaptation of the GETLN routine that resides in the Apple monitor (see Apple II Reference Manual, pp. 33-34 and 62-63). This subroutine, located at $FD6A (decimal -662), displays a prompt on the screen and waits for input from the keyboard. The subroutine is terminated when a carriage return is encountered, and returns with the input line in the input buffer (beginning at location $200, decimal 512). The X register holds the length of the input line. The monitor's GETLN supports all the editing features of the Apple. It also allows the entry of punctuation marks. The maximum length of the input line is 255 characters (bytes).

Now that we have an alternate way of entering data into the keyboard buffer, it seems a simple matter to PEEK from a Basic program and retrieve the string entered, one byte at a time. There is, however, one catch. Data entered into the keyboard buffer is, of course, in ASCII code. It is entered with the "high bit on," which means that 128 (or hex $80) has been added to it. Data entered from Basic is entered with the "high bit off."

The difference is more easily seen with an example. CHR$ (65) and CHR$ (193) both represent the letter "A." However, the computer will see them as different characters, because their ASCII code is

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```
300  20 6A FD   JSR   $FD6A   JSR monitor's GETLN
303  86 FD      STX   $FD     Save X register
305  A0 00      LDY   #$00    Initialize Y register
307  38         SEC
308  B9 00 02   LDA   $0200,Y Get input, one byte at a time,
30B  E9 80      SBC   #$80    and subtract $80 (decimal 128)
30D  99 00 02   STA   $0200,Y Replace with new value
310  C8         INY
311  C4 FD      CPY   $FD     End of input line?
313  F0 02      BEQ   $0317   Yes, return to Basic program
315  D0 F0      BNE   $0307   No, get another byte
317  60         RTS
```

Listing 1.

different. Therefore, if one was screening input and checking for a match, the wait would be a long one. For example, let's say that you have constructed a loop which asks for a series of strings to input. Further, after each entry the program checks to see if the string was the word "END," which you have chosen to be the signal that no more is to be entered. The program will check for the following ASCII values: 69 (E), 78 (N), 68 (D). The values retrieved from the keyboard buffer, however, when using the GETLN subroutine are: 197 (E), 206 (N), and 196 (D). Therefore, even when you have entered the string "END," the computer will fail to recognize this as the command to terminate the loop. The solution to this problem is to subtract $80 from each byte in the keyboard buffer before incorporating it into your string. That is what the routine in Listing 1 does.

This routine can also be POKEd into memory early in any program in which it is to be CALLed. The short routine in Listing 2 will accomplish this.

I use this subroutine in location $300 (decimal 768), but it has been written so that it is relocatable. If it is entered at $300, simply CALL 768 from a Basic program to use it.

```
 5 FOR Z = 768 to 791
10 READ A
15 POKE Z,A
20 NEXT Z
25 DATA 32,106,253,134,253,160,0,56,
   185,0,2,233,128,153,0,2,200,196,253,
   240,2,208,240,96
```

Listing 2.

```
10 CALL 768
20 E = PEEK (253)  E = length of input line
30 FOR Z = 0 to E-1
40 Y$ = CHR$ (PEEK (512 + Z)) PEEK input buffer, one byte at a time
50 A$ = A$ + Y$
60 NEXT Z
70 PRINT A$
```

Listing 3.

I have included a sample program in Listing 3 which will recover a string (A$) entered with this routine.

Using a string array will allow for more input. Also, using a variable to represent 512, the base address of the input buffer, will speed up the retrieving loop.

One final twist that you can add to your programs with this routine is the use of your own prompt symbols. The Apple GETLN subroutine outputs the prompt character held in location $33 (decimal 51) when asking for input. This is the familiar close bracket in Applesoft, or the asterisk when in the monitor. You may supply your own prompt character if you wish, POKEing the ASCII value of the character into $33. I have included a short routine in Listing 4 which, when appended to the Basic routine, will ask for 26 inputs, each prompted by succeeding letters of the alphabet.

Although this was written for the Apple II Plus, the concept behind it is simple, and should be adaptable to any microcomputer. The only special information required is a knowledge of where the GETLN routine, or its equivalent, resides in the monitor. □

```
 3  DIM A$(26)
 5  FOR C = 1 TO 26
 8  T = T + 1
 9  POKE 51,192 + T
10  CALL 768
20  E = PEEK (253)
30  FOR Z = 0 TO E-1
40  Y$ = CHR$ (PEEK (512 + Z))
50  A$(C) = A$(C) + Y$
60  NEXT Z
70  PRINT A$(C): PRINT
80  NEXT C
90  END
```

Listing 4.

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TRS-80 Model I Keyboard Repeat

Thomas Shapiro

```
10 Rem Automatic keyboard repeat by Tom Shapiro.
20 Rem Memory size=32654
30 POKE 16526,143:POKE 16527,127
40 FOR X=32655 TO 32767:READ A:POKE X,A:NEXT
50 X=USR(0)
60 DATA 33,152,127,34,22,64,195,25,26,33,54,64,1,1,56,22,0
70 DATA 10,95,163,32,26,119,20,44,203,1,121,214,128,32,241,126
80 DATA 6,7,45,134,16,252,254,0,62,0,192,50,26,64,201,166
90 DATA 40,16,58,26,64,60,50,26,64,254,255,32,217,61,50,26
100 DATA 64,123,115,197,1,0,2,205,96,0,193,10,163,200,197,229
110 DATA 245,6,64,58,61,64,230,253,103,246,2,111,125,211,255,124
120 DATA 211,255,197,6,64,16,254,193,16,242,241,225,193,195,251,3
```

The TRS-80 Model I computer comes with only one form of built in repeat function; its notorious and unpredictable keybounce. While an unwanted keyboard repeat is a nuisance, there are many occasions, especially in games, when a deliberately controlled repeat function is useful. This program will modify the keyboard scan routine to allow keyboard input to repeat as long as you hold a key down.

This works properly only in a 16K Model I TRS-80 with the memory size set to 32654. It takes a machine language program in DATA statements and POKEs it into protected memory. □

Thomas Shapiro, 1010 Fifth Ave., New York, NY 10028.

Quick Disk Catalog

Buck Buchanan

This handy program first takes the Control Character Finder program from page 151 of the Apple DOS 3.2 Manual and adds an EXEC program to catalog disks then print them.

The control characters will be visible on-screen only, of course.

Using this program it took five minutes to catalog and print my library of sixty disks. □

```
10  DATA  201,141,240,21,201,136
20  DATA  240,17,201,128,144,13
30  DATA  201,160,176,9,72,132
40  DATA  53,96,233,64,76,249
50  DATA  253,76,240,253
60  FOR I = 768 TO 768 + 27
70  READ V: POKE I,V: NEXT I
80  POKE 54,0: POKE 55,3
90  CALL 1002
100 D$ = ""
110   PRINT : PRINT : INPUT "WHAT
      IS THE NEXT DISK NUMBER? ";Z
      $
120   PRINT D$;"PR#1"
125   PRINT : PRINT : PRINT
127   PRINT "DISK NUMBER ";Z$
130   PRINT D$;"CATALOG"
140   PRINT D$;"PR#0"
150   GOTO 110
```

Buck Buchanan, P.O. Box 1263, Miri, Sarawak, East Malaysia.

Bit Pit

Chas Andres

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How does it work? Well, some mean but fun-loving aliens have produced some bouncing bombs. First they drop one and you've got to position yourself under it and zap it with your laser. If you miss, that's OK. It will bounce around, although each bounce is lower, and you have several chances to zap it. Got the hang of it? OK, here come two bouncing bombs. You zap them. Then you're faced with three, then four and five.

As they bounce longer and longer the walls begin to close in so you're faced with either zapping the bombs or being hit. Each hit knocks you a little further toward the gutter. But you can survive two hits which is usually enough to zap all the bombs.

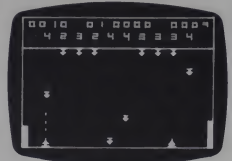
Feeling confident? Don't. Because after 5 bombs the murderous little devils drop 5 bonus bombs, worth ten times as much. These don t bounce, so you get only one shot. You need nerves of steel and the reflexes of a tail gunner.

After you complete one round,the game starts again with bombs that bounce faster and lower (and are worth more) than the previous ones.

Blister Ball is a fantastic solo game. But there are two-player options as well in which players can play as a team or as opponents. Each player can move the entire width of the screen and zap any of the bombs. Here, you're not only trying to survive, but trying to outscore your opponent. The game has two skill levels.

Mad Bomber

In **Mad Bomber** you are faced with aliens in a huge ship hovering overhead. They have bomb racks which they constantly fill with bombs. Your object is to move from side to side on the ground and zap the bombs in the bomb racks or as they fall.



As the game progresses, the aliens fill up their bomb racks more quickly and the bombs fall faster. You lose after ten bombs have hit the area which you are defending.

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DIGITAL DIDACTICS

Donald T. Piele

It is not easy to find a good format for teaching problem solving with the computer. On the one hand if you simply supply a set of problems and provide no assistance, many students have trouble getting started and learn very little from their feeble attempts. And many of those who do manage to produce a running program write very poor programs and do not learn the new skills and techniques that you hoped the problem would develop.

At the other extreme, if you provide too much help, the exploratory activity, which is so vital for the development of problem solving skills, is lost. What is needed is a compromise strategy. Here is one such strategy that I am currently using in a class I teach each summer on computer problem solving skills held at the University of Wisconsin-Parkside.

The Strategy

All of the students in the class have at least an elementary knowledge of Basic. However, there are wide differences in their programming experience and sophistication. Consequently, I let the students progress through the lessons at their own rate. Each lesson consists of two parts:

Part I consists of a series of short programs that asks the question: "What does this program do?" It is the student's job to figure out an answer to this question. This should be tried first by reading through the statements of the program and following the algorithm manually using paper and pencil if necessary. If this proves too difficult, the program may be typed in and run. This is also the way that the students can confirm their answers. Part I provides the opportunity to see specific programming techniques and algorithms in action. For many students this may be the first time they have encountered these ideas.

Part II consists of a set of problems that can be solved efficiently using the concepts from Part I. This provides the all-important challenge of writing a complete solution to a given problem. Advanced students may go directly to Part II.

Donald T. Piele, Department of Mathematics, University of Wisconsin-Parkside, Kenosha, WI 53141.

The Format

It is a shame to go to all the effort to write a logically correct program and then discover that no one else can read it, and in a week or so, neither can the creator of the program. Thus, I begin each class by insisting that the work handed in conform to a minimum format. Students will be writing and reading programs on a regular basis and the class will run more smoothly if some standards are established early. Again, there are extremes that must be avoided if you want a set of rules to work. Here is what works for me.

1. Begin all programs as follows.

```
10 PRINT  "(Program Name and/or Number)"
20 PRINT  "(Your Name, Date Completed)"
30 PRINT
```

2. Use REMARK statements liberally. Keep them on the same line if you have the room.

```
10 C=C+1                    :REM C is the loop counter.
```

(PET and TRS-80 get by with one colon)

```
15 IF A=B THEN 200::::::::REM Branch on equality
```

(The Apple II requires multiple colons)

```
20 D=R*T                    'Distance = Rate X Time
```

(Microsoft Basic's alternative to REM)

3. Use indentation.

```
10 FOR I=1 TO 10              10 FOR I=1 TO 10
20:    FOR J=1 TO I           20::::FOR J=1 TO I
30:       PRINT I*J           30::::::::PRINT I*J
40:    NEXT J                 40::::NEXT J
50 NEXT I                     50 NEXT I
```

(PET and TRS-80) (Apple II)

Some Basics, including Microsoft Basic, indent without the use of colons.

4. Separate parts of the program for easy reading.

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CIRCLE 234 ON READER SERVICE CARD

```
10 PRINT "ADD THEN UP"
20  FOR I=1 TO 10
30    C=C+I
40  NEXT I
50:
60 PRINT "THE TOTAL IS ";C
70 END
```

5. Keep a neat record of all of your work. List your programs on 8 1/2" x 11" paper or cut them up and tape them to paper of this size. Hand in a listing and the desired sample runs. Of course, you are free to add your own ideas to make the programs more readable. This is only a minimum readability format.

The programs found in this series this month and hereafter will follow this format. Here is a sample lesson.

Digit Extraction

It is often necessary to be able to dissect a number digit-by-digit with the computer. For example, if you want to add up the digits of a number or compute how many digits are repeated in a given number, then you must be able to isolate each one.

Part I

Consider the following programs. Try to read through each program and understand what it does. Refer to a Basic reference manual if necessary. Then type in each program, run it, and confirm your answer.

```
 10 PRINT "DIGIT 1"
 20 PRINT "WHAT DOES THIS PROGRAM DO?"
 30 PRINT
 40   INPUT "ENTER A THREE DIGIT NUMBER ";X
 50      H=INT(X/100)
 60      Y=X-100*H
 70      T=INT(Y/10)
 80      U=Y-10*T
 90    PRINT H;"-";T;"-";U
100 END
```

Now that you know what Digit 1 does, try your hand with Digit 2.

```
 10 PRINT "DIGIT 2"
 20 PRINT "WHAT DOES THIS PROGRAM DO?"
 30 PRINT
 40   INPUT "ENTER A WHOLE NUMBER ";X
 50         D=D+1
 60         IF INT(X/10^D)>0 THEN 50
 70:
 80         FOR I=D-1 TO 0 STEP -1
 90             N=INT(X/10^D)
100             PRINT X;N
110             X=X-N*10^I
120         NEXT I
130 END
```

Try a variety of sizes of whole numbers, 123, 12345, etc. Can you explain why Digit 2 doesn't do what you expected?

```
 10 PRINT "DIGIT 3"
 20 PRINT "WHAT DOES THIS PROGRAM DO?"
 30 PRINT
 40   INPUT "ENTER A WHOLE NUMBER ";X
 50         D=D+1
 60         IF INT(X/10^D)>0 THEN 50
 70:
 80   DEF FNF(X)=X-INT(X)
 90       FOR I=D TO 1 STEP -1
100         N=INT(10*FNF(X/10^I))
110         PRINT N;" ";
120       NEXT I
130 END
```

Does Digit 3 do what you expected? Be sure to try large whole numbers. How can the program be modified to work correctly?

```
10 PRINT "DIGIT 4"
20 PRINT "WHAT DOES THIS PROGRAM DO?"
30 PRINT
40   INPUT "ENTER A WHOLE NUMBER ";X$
50         N=LEN(X$)
60         FOR I=1 TO N-1
70             PRINT MID$(X$,I,1);"/ ";
80         NEXT I
90   PRINT RIGHT$(X$,1)
100 END
```

Would Digit 4 work with a 70 digit number or do you need to modify it?

There are two functions that come in very handy when working with digits that have been extracted from whole numbers. They are STR$( ) and its inverse VAL( ). STR$( ) takes a number, like 123, and transforms it into the word or string "123". VAR( ) goes in reverse and transforms the string "123" into the number 123:

STR$(123) = "123"
VAL("123")= 123

Thus, VAL(STR$(X)) = X and STR$(VAL(X$))=X$, where X is a number and X$ is a number string. Also STR$(1)+STR$(2)="12," STR$(1+2)="3", VAL("1"+"2")=12, and VAL("1")+VAL("2")=3.

Part II

The following programs can be solved by using the ideas presented in Part I. They vary in difficulty from easy to medium hard. The solutions will appear next month.

1. *Sum of Digits Squared*

Write a program that will accurately sum the squares of each digit in a given whole number. For example, the answer for 123 should be 14.

2. *The Digital Sum*

If the digits of a whole number larger than 9 are added together the result is a smaller whole number. If the sum is still larger than 9, then, when its digits are added together, the next number is also smaller. This process will continue to generate smaller and smaller sums until the number is less than or equal to 9. The final single digit number is called the Digital Sum.

Write a program that will accept a whole number up to 40 digits long and find its Digital Sum. The program should show all the intermediate steps. For example, the output for the number 123456789 should be:

```
123456789
 45
 9   THE DIGITAL SUM
```

3. *Armstrong Numbers*

An N-digit number is called an Armstrong Number if the sum of the Nth power of each digit is equal to the number itself. Note that 153 is a 3-digit Armstrong Number because

$1^3 + 5^3 + 3^3 = 153$.

Write a program that will find all N-digit Armstrong Numbers where N is supplied by the user. Test your program for n=2, 3, 4.

4. *Balanced Numbers*

We will define a number as Balanced if the maximum digit in the number is equal to half the sum of all the digits. For example, 123 is balanced because (1+2+3)/2=3.

Write a program that will find all of the Balanced Numbers from 1 to N where N is supplied by the user. Test your program for N= 200, and 1000.

5. *Palindromes*

A number is called a Palindrome if it reads the same backwards as forwards. For example, 121, 14641, and 234432 are all Palindromes. If a number is not a Palindrome, it can usually be made into one by a simple reversal and addition

process as follows. Reverse the digits of the number and add it to itself. If the result is not Palindromic then repeat the process again. For example, beginning with 75 we have:

```
   75
+  57
  ---
  132 which is not a Palindrome,
+ 231
  ---
  363 which is a Palindrome.
```

The number 75 requires two reversals before it becomes a Palindrome. Write a program that will examine all three digit numbers and print out the numbers that require 0, 1, 2, 3, 4, 5-10, 11-25, and over 25 reversals before they become Palindromes—if ever.

Contest Solutions

Listed below are the solutions to the First International Computer Problems Solving Contest sponsored by the University of Wisconsin-Parkside. The solutions are written in Microsoft Basic and will run on a PET, TRS-80, Apple II, or other systems that use a version of Microsoft Basic. Occasional minor modifications will be needed. The problems appeared in this series last month. □

Junior Division

```
10 PRINT "JR PROBLEM #1 "
20 PRINT "PARKSIDE'S TRIANGLE"

30  INPUT "WHAT IS THE SIZE (1<= N <=20) "!N
40  IF INT(N)<>N THEN PRINT "INTEGER PLEASE " : GOTO 30
50  IF N<1 OR N>20 THEN PRINT "OUT OF BOUNDS ": GOTO 30

60  INPUT "WHAT IS THE SEED (1<= S <=9) "!S
70  IF INT(S)<>S THEN PRINT "INTEGER PLEASE ": GOTO 60
80  IF S<1 OR S>9 THEN PRINT "OUT OF BOUNDS ": GOTO 60

90      PRINT:PRINT "SIZE="N;", SEED="S

100     FOR R=1 TO N                'R=ROW NUMBER
110        FOR C=1 TO R             'C=COLUMN NUMBER
120           PRINT S;              'S=NUMBER TO BE PRINTED
130           S = S +1              'INCREMENT S
140           IF S>9 THEN S=1       'WRAP S AROUND
150        NEXT C
160        PRINT                    'END OF ROW
170     NEXT R

180     PRINT
190 END
```

```
JR PROBLEM #1
PARKSIDE'S TRIANGLE

SIZE 6 , SEED 1

 1
 2 3
 4 5 6
 7 8 9 1
 2 3 4 5 6
 7 8 9 1 2 3

JR PROBLEM #1
PARKSIDE'S TRIANGLE

SIZE 7 , SEED 9

 9
 1 2
 3 4 5
 6 7 8 9
 1 2 3 4 5
 6 7 8 9 1 2
 3 4 5 6 7 8 9
```


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CIRCLE 160 ON READER SERVICE CARD

How to Solve It, continued...

```
10 PRINT "JR PROBLEM #2"
20 PRINT "ROUND NUMBERS"

30      INPUT "ENTER A POSITIVE INTEGER "!N
40      IF N<>INT(N) OR N<1 THEN PRINT "TRY AGAIN' "!GOTO 30

50      FOR I=1 TO N
60        X=I                          'X = The present intemer.
70        L=0                          'L = The lenoth of the binary rep. of X.
80        R=0                          'R = The number of 1's in binary rep.

90        R=X-2*INT(X/2)+R             'Accumulate remainders after division by 2
100       L=L+1                        'Keep track of the binary lenoth of X.
110       X=INT(X/2)                   'Divide the integer in half.
120     IF X>1 THEN 90                 'Continue dividino until all remainders
121                                    'have been found.

130     IF R < L/2 THEN C=C+1          'Test for roundness of X. C=counter
131                                    'for round numbers.
140     NEXT I

150     PRINT "THERE ARE"!C!" ROUND NUMBER LESS THAN OR EQUAL TO"!N

160 END
```

```
JR PROBLEM #2
ROUND NUMBERS

THERE ARE 5  ROUND NUMBER LESS THAN OR EQUAL TO 10

JR PROBLEM #2
ROUND NUMBERS

THERE ARE 47  ROUND NUMBER LESS THAN OR EQUAL TO 100
```

```
10 PRINT "JR PROBLEM #3"
20 PRINT " NFL Helmets"

25   PRINT
30   DIM H(28)                        'Room for 28 helmets
40   H=0                              'H= Total number of unique helmets.
50   S=0                              'S= Money spent.

60   S=S+.25                          'Deposit a quarter.
70   R= INT(28*RND(1))+1              'Get Random Helmet.
80   IF H(R)=0 THEN H=H+1 : H(R)=1    'If it's new count it and remember it.

90   IF H<28 THEN 60                  'Continue until you have then all.

100     PRINT "TOTAL SPENT TO GET ALL 28 HELMETS = $"!S
105 PRINT
110 END
```

```
JR PROBLEM #3
 NFL Helmets

TOTAL SPENT TO GET ALL 28 HELMETS = $ 33

JR PROBLEM #3
 NFL Helmets

TOTAL SPENT TO GET ALL 28 HELMETS = $ 24.5

JR PROBLEM #3
 NFL Helmets

TOTAL SPENT TO GET ALL 28 HELMETS = $ 19
```

```
10 PRINT "JR PROBLEM #4"
20 PRINT "Letter Count"

30      DIM T$(80)                    'Leave room for each line of text.
35      DIM T(26)                     'Leaver room for countino letters.

40      READ T$                       'T$= one line of text.
50      IF T$="/END/" THEN 200        'If done readino then bemin orderino.
```

```
60      FOR I=1 TO LEN(T$)
70        C$=MID$(T$,I,1)              'C$=The I'th character in T$
80        IF C$<"A" OR C$>"Z" THEN 120 'Skip over non alpha characters.
90        C=ASC(C$)-64                 'Translate so that 1<=C<=26
100       T(C)=T(C)+1                  'T(C)= individual character total.
110       T=T+1                        'T= total number of characters.
120     NEXT I

130 GOTO 40                            'Continue reading lines of text.

200 '           PRINT OUT THE CHARACTERS IN FREQUENCY ORDER

205 PRINT
210 PRINT "LETTER          FREQUENCY          PERCENTAGE"
215  MAX=0
220    FOR I=1 TO 26
230      IF T(I)>MAX THEN MAX =T(I) : C=I
240    NEXT I
250      IF MAX=0 THEN 300
260      PRINT CHR$(C+64)TAB(17)!MAX!TAB(38)!INT(10000*MAX/T)/100
270      T(C)=0
280    GOTO 215

300 PRINT "TOTAL"!TAB(17)!T
310 END

500 DATA "CONSIDER A PARAGRAPH CONTAINING SEVERAL LINES OF TEXT"
510 DATA "INFORMATION. YOU ARE TO WRITE A PROGRAM TO PRINT A LETTER"
520 DATA "FREQUENCY TABLE WHICH WILL LIST THE FREQUENCY AND PERCENTAGE"
530 DATA "OF OCCURRENCES OF EACH LETTER (A THROUGH Z) OF THE TEXT IN "
540 DATA "ORDER OF HIGHEST FREQUENCY FIRST."
550 DATA "/END/"
```

JR PROBLEM #4
Letter Count

LETTER	FREQUENCY	PERCENTAGE
E	29	13.3
R	22	10.09
T	22	10.09
A	16	7.33
O	16	7.33
N	15	6.88
I	14	6.42
C	11	5.04
F	10	4.58
H	10	4.58
L	9	4.12
S	7	3.21
G	6	2.75
U	6	2.75
P	5	2.29
Y	4	1.83
D	3	1.37
Q	3	1.37
W	3	1.37
M	2	.91
X	2	.91
B	1	.45
V	1	.45
Z	1	.45
TOTAL	218	

```
10 PRINT "JR PROBLEM #5"
20 PRINT "Missionaries and Cannibals"

30      PRINT "    ISLAND","MAINLAND","STATUS"
32        M$="MMM" : C$="CCC"
35      PRINT
40      FOR MC=0 TO 3          'MC=Mainland cannibals.
50        IC = 3-MC            'IC=Island cannibals.
60          FOR MM=0 TO 3      'MM=Mainland missionaries.
70            IM=3-MM          'IM=Island missionaries.
80              N=N+1          'N = number of arrangements

90    PRINTING ROUTINE
100       PRINT STR$(N)!","!TAB(5)!
110         PRINT RIGHT$(M$,IM)!RIGHT$(C$,IC),
120         PRINT RIGHT$(M$,MM)!RIGHT$(C$,MC),
150             IF IM<IC AND IM>0 THEN 180
160             IF MM<MC AND MM>0 THEN 180
170       PRINT "SAFE"!
180       PRINT

190     NEXT MM
200 NEXT MC
210 END
```


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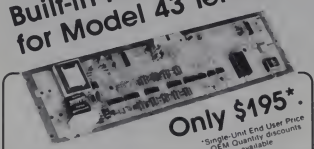

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How to Solve It, continued...

```
JR PROBLEM #5
Missionaries and Cannibals

      ISLAND    MAINLAND          STATUS

 1.   MMMCCC                      SAFE
 2.   MMCCC     M
 3.   MCCC      MM
 4.   CCC       MMM               SAFE
 5.   MMMCC     C                 SAFE
 6.   MMCC      MC                SAFE
 7.   MCC       MMC
 8.   CC        MMMC              SAFE
 9.   MMMC      CC                SAFE
10.   MMC       MCC
11.   MC        MMCC              SAFE
12.   C         MMMCC             SAFE
13.   MMM       CCC               SAFE
14.   MM        MCCC
15.   M         MMCCC
16.             MMMCCC            SAFE
```

Senior Division

```
10 PRINT "SR PROBLEM #1"
20 PRINT "PARKSIDE'S OTHER TRIANGLE"

30      INPUT " ENTER SIZE,SEED"; N,S
40      IF N<1 OR N>20 OR S>9 OR S<>INT(S) THEN 30
50      PRINT:PRINT "SIZE ";N;",SEED ";S
60      PRINT

70      FOR R=1 TO N                    'R=ROW NUMBER
80        X=S+R-1                       'X=NUMBER TO BE PRINTED
90          FOR C=1 TO N                'C=COLUMN NUMBER
100     IF C<R THEN PRINT "   ";:GOTO 120
110       PRINT X;
120         X=X+C
130         IF X>9 THEN X=X-9
140       NEXT C
150       PRINT
160     NEXT R
170     PRINT
180 END
```

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```
SR PROBLEM #1
PARKSIDE'S OTHER TRIANGLE

SIZE  6 ,SEED  1

  1  2  4  7  2  7
     3  5  8  3  8
        6  9  4  9
           1  5  1
              6  2
                 3


SR PROBLEM #1
PARKSIDE'S OTHER TRIANGLE

SIZE  7 ,SEED  9

  9  1  3  6  1  6  3
     2  4  7  2  7  4
        5  8  3  8  5
           9  4  9  6
              5  1  7
                 2  8
                    9
```

```
10 PRINT "SR PROBLEM #2"
20 PRINT "DIGITAL PRODUCT"

30      PRINT
40      DIM A$(70),B$(70),C$(70)
50      INPUT "ENTER THE NUMBER ";C$
60      PRINT C$

70      A$="1"                          'SET A$ TO IDENTITY ELEMENT
80      FOR Y=1 TO LEN(C$)              'SCAN INPUT NUMBER
90         T=VAL(MID$(C$,Y,1))          'EVALUATE A DIGIT OF THIS NUMBER
100        IF T>0 THEN A=T:GOSUB 170    'IF NOT 0, MULTIPLY BY DIGIT
110           A$=B$                     'SWAP NUMBERS
120     NEXT Y                          'NEXT DIGIT
130     PRINT B$                        'PRINT NEXT DIGIT PRODUCT
140     IF LEN(B$)>1 THEN C$=B$:GOTO 70 'REPEAT UNTIL ROOT IS FOUND

150     PRINT:PRINT "THE DIGITAL PRODUCT ROOT IS ";B$
160 END

170 ' SUBROUTINE
180     B$="" : C=0                     'C=CARRY ,B$=DIGIT PRODUCT
190     FOR X=LEN(A$)TO 1 STEP -1       'STANDARD STRING MULT.
200        P=A+VAL(MID$(A$,X,1))
210        P=P+C : C=0
220        IF P>9 THEN P=P-10:C=C+1:GOTO 220
230           X$=RIGHT$(STR$(P),1)      'NOT NECESSARY ON APPLE II
240           B$=X$+B$
250     NEXT X
260           Y$=RIGHT$(STR$(C),1)      'NOT NECESSARY ON APPLE II
270           IF C>0 THEN B$=Y$+B$
280  RETURN
```

```
 SR PROBLEM #2
 DIGITAL PRODUCT

 7
 7

 THE DIGITAL PRODUCT ROOT IS 7


 SR PROBLEM #2
 DIGITAL PRODUCT

 100
 1

 THE DIGITAL PRODUCT ROOT IS 1
```

```
 SR PROBLEM #2
 DIGITAL PRODUCT

 123456789
 362880
 2304
 24
 8

 THE DIGITAL PRODUCT ROOT IS 8


 SR PROBLEM #2
 DIGITAL PRODUCT

 999999999
 3486784401
 516096
 1620
 12
 2

 THE DIGITAL PRODUCT ROOT IS 2
```


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How to Solve It, continued...

```
10 PRINT "SR PROBLEM #3"
20 PRINT "BUG WALK"

30      INPUT "ENTER N,P "!N,P                  'N=SIZE, P=PROBABILITY
40      IF P<=0 OR P>=1 THEN 30
50      DIM A(2*N)                              'ARRAY TO SAVE VISITS
60        R=RND(1)                              'RANDOM NUMBER
70        IF R < P THEN X=X+I                   'MOVE TO THE RIGHT
80        IF R >=P THEN X=X-I                   'MOVE TO THE LEFT
90          A(X+N)=A(X+N)+1                     'SAVE THE VISIT
100       IF A(N)=10 THEN 1000                  'HOME HAS BEEN VISITED 10 TIMES
110       IF X=N THEN X=X-I ! GOTO 90           'BOUNCE OFF THE ENDS
120       IF X=-N THEN X=X+I: GOTO 90
130       GOTO 60

1000  PRINT OUT OF POSITIONS VISITED
1002  PRINT
1004  PRINT "N=";N;" P=";P
1005  PRINT "SQUARE","OCCURRENCES"
1007  PRINT
1010    MAX = 0
1020     FOR I=0 TO 2*N                         'SEARCH FOR LARGEST FREQ.
1030       IF A(I)>MAX THEN MAX = A(I) : C=I
1040     NEXT I

1050    IF MAX=0 THEN 2000
1060    PRINT C-N,A(C)                  'C IS THE POSITION OF LARGEST FREQ.
1070    A(C)=0
1080    GOTO 1010
2000 END
```

```
    SR PROBLEM #3                       SR PROBLEM #3
    BUG WALK                            BUG WALK

    N= 5  P= .5                         N= 6  P= .666667
    SQUARE      OCCURRENCES             SQUARE      OCCURRENCES

     4              18                    5             331
    -1              14                    6             224
     3              13                    4             163
    -2              12                    3              83
     5              12                    2              42
     2              11                    1              23
    -4              10                    0              10
    -3              10                   -1               2
     0              10
     1               8
    -5               4
```

```
10 PRINT "SR PROBLEM #4"
20 PRINT "WORD COUNT"
25 PRINT

30      DIM B(12)                       'B( ) HOLD THE FREQUENCY
40      READ A$                         'READ A LINE
50      IF A$="/END/" THEN 130          'END OF TEXT
60      C=0                             'C=WORD LENGTH COUNTER
70        FOR Y=1 TO LEN(A$)            'COUNT THE LENGTH OF THE WORDS
80          A=ASC(MID$(A$,Y,1))
90          IF A<65 OR A>90 THEN B(C)=B(C)+1 :C=0 :GOTO 110
100         C=C+1
110       NEXT Y
120       GOTO 40                       'NEXT LINE

130   PRINT OUT THE FREQUENCY AND PERCENTAGE TABLE
140     PRINT "LENGTH","FREQUENCY","PERCENTAGE"
150       FOR I=1 TO 12 : T=T+B(I) : NEXT I   'T=TOTAL FREQ.
155       MAX=0
160          FOR I=1 TO 12
170            IF B(I)>MAX THEN MAX = B(I) : C=I
180          NEXT I
190           IF MAX=0 THEN 230
200              PRINT C;B(C),100*B(C)/T
210           B(C)=0
220       GOTO 155
230   PRINT "TOTAL",T
240 END

1000  ***  DATA ***
1010 DATA "CONSIDER A PARAGRAPH CONTAINING SEVERAL LINES OF TEXT "
1020 DATA "INFORMATION. YOU ARE TO WRITE A PROGRAM TO PRINT A WORD "
1030 DATA "LENGTH FREQUENCY TABLE. THIS TABLE SHOULD LIST THE WORD "
1040 DATA "LENGTH, FREQUENCY OF OCCURRENCES, AND PERCENTAGE, IN THREE "
1050 DATA "COLUMNS, IN ORDER OF HIGHEST FREQUENCY FIRST. "
1060 DATA "/END/"
```

```
      SR PROBLEM #4
      WORD COUNT

      LENGTH          FREQUENCY       PERCENTAGE
        5                 8             18.6047
        2                 7             16.2791
        4                 5             11.6279
        3                 4              9.30233
        7                 4              9.30233
        9                 4              9.30233
        1                 3              6.97674
        6                 3              6.97674
       10                 2              4.65116
       11                 2              4.65116
        8                 1              2.32558
      TOTAL              43
```

```
10 PRINT "SR PROBLEM #5"
20 PRINT "SHUTTLE PUZZLE"

30      INPUT "ENTER N "!N
40      DIM A$(2*N+1),B$(2*N+1)                 'A$=GIVEN, B$=GOAL
45      A$="" : B$=""
50      FOR I=1 TO N
60        A$=A$+"O" : B$=B$+"1"
70      NEXT I
80          A$=A$+"X"+B$ : B$=B$+"X"+M1D$(A$,1,N)
90      PRINT: PRINT "N="!N

100     PRINT A$                                'A$=CURRENT STATE
110     GOSUB 1000                              'LOCATE THE X SPACE

120 '*** MOVE X TO LEFT ***
130     IF J=1 THEN 200                         'J=POSITION OF X
140     IF J=2 THEN 180
150   IF M1D$(A$,J-2,3)="01X" THEN M1D$(A$,J-2,3)="X10":PRINT A$:GOTO 110
155   IF M1D$(A$,J-2,3)="10X" THEN M1D$(A$,J-2,3)="1X0":PRINT A$:GOTO 110
160   IF M1D$(A$,J-1,3)="0X1" THEN M1D$(A$,J-1,3)="X01" :PRINT A$:GOTO 110

190     GOSUB 1000                              'J=POSITION OF X

200 '*** MOVE X TO RIGHT ***
210     IF J=2*N+1 THEN 300                     'J AT RIGHT ALREADY
220     IF J=2*N   THEN 280
230   IF M1D$(A$,J,3)="X01" THEN M1D$(A$,J,3)="10X" : PRINT A$:GOTO 190
240   IF M1D$(A$,J,3)="X10" THEN M1D$(A$,J,3)="1X0" :PRINT A$:GOTO 190
280   IF M1D$(A$,J-1,3)="0X1" THEN M1D$(A$,J-1,3)="01X":PRINT A$:GOTO 190

290     IF A$=B$ THEN END                       'GOAL IS REACHED
300     GOTO 110

1000    SUBROUTINE TO FIND POSITION OF X
1010      FOR J=1 TO 2*N+1
1020        IF M1D$(A$,J,1)="X" THEN RETURN
1030      NEXT J
```

```
      SR PROBLEM #5
      SHUTTLE PUZZLE

      N= 3
      000X111
      00X0111
      0010X11
      00101X1
      001X101
      0X10101
      X010101
      10X0101
      1010X01
      101010X
      10101X0
      101X100
      1X10100
      11X0100
      1110X00
      111X000
```

```
      SR PROBLEM #5
      SHUTTLE PUZZLE

      N= 4
      0000X1111
      000X01111
      0001X1111
      00X101011
      0010X1011
      001X01011
      0100X1011
      010X01011
      0101X0X11
      0101010X1
      0101010XX
      010101X10
      01011X010
      01X101010
      X1010101O
      1X0101010
      11X001010
      11010X010
      110101X00
      11011X000
      111X01000
      1111X0100
      11111X000
      111110X00
      1111101X0
      11111010X
      111110101
```


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Vol. 4, No. 4—Jul/Aug 1978

Features on Business Computing and Word Processing: Special Section on Interfacing Your Computer to the Outside World: Three Perspectives on Video Games: ROM Section: High Resolution Graphics for Apple II; GAMMON and EVILK Motor Cycle Jump Game Programs. Evaluations: Pet; Apple II; Atari Video Pinball; Atari Video Computer.

Vol. 3, No. 5—Sept/Oct 1977

Dynamic Debugging System for 8080 Assembly Language; Bibliography of "Limits to Growth" Models; Dwyer: 8 Hour Course in Basic—Part 2; Programming Approaches to Solving Complex Equations; Computerized Conferencing. Symmetric Art on your Computer. Games: Nomad, Rotate, Lissajous. Evaluations: 5 Microcomputer Basics; Software Technology Music System.

Vol. 4, No. 5—Sept/Oct 1978

Educational Features; 4 Simulation Articles; Accounts Receivable Systems; Real World Games; A Real-Time Clock You Can Build; All about PASCAL; Intelligent Videodiscs; 40 Programming Ideas; ROM Section: Hex and Star War Games. Evaluations: Exidy Sorcerer; Radio Shack TRS-80; Bally Arcade; Speak & spell and Spelling B; Computalker Speech Synthesizer; Peninsula Pet Cassettes, Merlin Video Interface.

Vol. 3, No. 6—Nov/Dec 1977

Programming Techniques: File Structures; CAI: Multiple Problem Types; Computer History Quiz; Final Exams by Computer; Dwyer: 8 Hour Course in Basic—Part 3. Mastermind II, Othello, and Inorganic Chemistry Programs. Evaluations: Nine Microcomputer-based Toys. Comp IV; S-100 Compatible Kits. IDL Xitan, and three 8080 8K Basics.

Vol. 4, No. 6—Nov/Dec 1978

Consumer Computers Buying Guide; Critical Path Analysis; Experiment in Teaching Strategic Thinking; ROM Section. Subject Index and File Index in Basic. Programs for Mail Lists, Patterns, Plotting, Corral, Joust, Puzzle, and a Christmas Letter. Evaluations: CP/M Disk Operating Systems; North Star Horizon; Backgammon Computers; Smart Electronic Games and Video Games.

Vol. 1, No. 1—Jan/Feb 1978

Fast Sorting Algorithm; How to Write a Computer Simulation; More File Structures; LOGO; Murphy's Laws; Dwyer: 8 Hour Course in Basic—Part 4. Programs for World Population Model, Biorhythms in Basic and APL, Yahtzee, Van Gam, Kirkof, and Network. Evaluations: 3 Electronic Games; Radio Shack TRS-80; Heath H8 System.

Vol. 5, No. 1/January 1979

Computers and Robots in Fiction; Guidance Counselor System; Survey of Educator's Attitudes; How to Hide Your Basic Program; A Program to Calculate Depreciation for Taxes, and the Space Maze Game. Counterfeit Cursor and Speed Reading for the Pet. Evaluations: Microsoft Fortran-80; Structured Programming with Tiny C; Smoke Signals Text Editor; Exidy Sorcerer; Ohio Scientific Superboard II.

Vol. 5, No. 2—February 1979

Multiple Regression Analysis Simplified; Budget Management; Sports Predictions; PEEKing and POKEing for Video Displays; Interview with Michael Shrayer; Computers and Education—Questions of Value; Game Programs for Gold Mine and Atom 20. Evaluations: Heathkit H-8; Thinker Toys Floppy Disk; Electric Pencil; Western Digital Pascal Chip Set; Four Computer Music Records.

Vol. 5, No. 3—March 1979

Six Articles on Data Base Management; Sports Judging on a Microcomputer; Shopping for a Payroll System; Programming the Game of Go; Business Computing with the Sorcerer; Social Science Survey Program. Evaluations: Terrapin Turtle Videobrain; Pet Monitor; TRS-80 Floppy Disk; Apple Floppy Disk.

Vol. 5, No. 4—April 1979

Safeguarding Your Computer; Interpretive Programming; Elements of a Good Computer Game; Music Composition; Marin Computer Center Programs for An Intelligent Calendar, Vertical Graphs and Bar Graphs, Flowers for the PET. Evaluations: Checker Challenger; Video Checkers, Checkbook Maintenance System; Whatsit Data Base Management Program.

Vol. 5, No. 5—May 1979

Word Processing Systems; Pilot Tutorial; Writing User-Oriented Programs; Amortization Schedules, Reading and Comprehension Exams; Hiding Your Basic Program; Cribbage and Mille Bornes Game Programs. Evaluations: WP Daisy Word Processing; Wordmaster Text Editor; PDI IQ Builder; Malibu 160 Line Printer

Vol. 5, No. 6—June 1979

Eight Articles on Computer Graphics and Plotting; Editing Basic Strings; Microcomputers in the Hospital; Billing Program for the Sorcerer, Inkblot and Greed Game Programs. Evaluations: TRS-80 Voice Synthesizer, HIPLOT Digital Plotter; Structured Systems, Name and Address Program, ALF Apple Music Synthesizer.

Vol. 5, No. 7—July 1979

Four features on Sorting, Files and Data Bases; Creativity Test; World Power Systems; Personal Finance Model; Two Ecological Simulations. Programs for an Ecological Game, Sniche, Brain Teaser, and Zone X. Evaluations: BrighterWriter, SWTPC CT-82 Graphics Terminal; APF PeCo-One; Heuristics Speechlab; Micro Pet Super Sort; Diagnostic Programs for the Pet.

Vol. 5, No. 8—August 1979

Can Computers Think? 5 Basic Language Programming Techniques; The Law and Your Computer; muMath; Image Processing. Manipulating Pencil Files; Adventure: a new type of computer game simulation. The Games HVOLT and FORT. Evaluations: Texas Instruments 99/4; Radio Shack TRS-80 Model II; SWTPC PR-40 for the Pet; IMSAI VIO.

Vol. 5, No. 11—November 1979

Adventure: Complete Listing in Basic. Controlling Household Devices; Car Pooling; Mumps language. Computer Art Exhibition; Build Your Own Joysticks; Telephone Dialer for TRS-80 or Northstar; Teacher-Made Tests; Evaluations: Comparison Chart of 6 Popular Personal Computers; Comparison of 26 Single Board Computers; Electronic Games & Toys; Quick Printer II; Interact Computer; User-Definable Character Generators; TRS-80 Level III Basic; Pet Software from Creative Software; Word Processor; Introl X-10 Home Control System.

Vol. 5, No. 12—December 1979

Controlling Household Devices: Part 2; LOGO: Computerized Biofeedback; Computers at the Rodeo; Creating Digitized Video Images. Programs for using the Microcomputer as an Investment Tool: Animation on the Apple; Magic Tricks; "Turn-Key" CP/M System. Evaluations: More Electronics Games; Language Translators; APF MP1000 Video Game System; 6 Word Processing Printers; Satellite Tracking Software; SysKit for the 8080; Assemblers: CP/M vs. TSC; Statistics for the TRS-80.

Vol. 6, No. 1—January 1980

Interviews with Donald E. Knuth and William Wulf: Six Features on Artificial Intelligence: Air Traffic Controller; Computerized Resume; GROW: A Program that Learns; Evaluations: Six Basics; NEWDOS and TRSDOS; Auto Scribe; Micro Music.

Vol. 6, No. 2—February 1980

Six Articles on Investment Analysis; David Levy: Intelligent Computer Games; Programs for Geology, Graphing, Genetics; Evaluations: Word Star vs Electric Pencil; Pascal for the TRS-80; Micro Composer; Data Dabber; Sorcery Word Processing Pac; Trivia Contest Results.

Vol. 6, No. 3—March 1980

Networks for Personal Computers; Artificial Intelligence: How to Make a Basic Tree; Interview with Joel Birnbaum; Three Mile Island Game; Extended Precision Computation; Rolodex Data Base Program; Photographing Your Computer System. Evaluations: TI 99/4 Modems, Cobol, Tiny C, 10 Software Packages.

Vol. 6, No. 4—April 1980

Dr. KiloBYTE's Creative Popular Personal Recreational Micro Computer Data Interface World Journal—the famous 73 page April Fool parady. 8 Articles on Reading and Language. Interview with Gordon Bell. Evaluations: Heath WH-89; Atari 800 vs PET; Chatworth Mark Sense Card Reader. Adventure.

Vol. 6, No. 5—May 1980

Seven Features on Saving Money with your Computer: Analysis of Stock Options, Budgeting Model, Shopping Lists, Home Inventory, Home Purchase, Retirement Planning. Computer-Aided Model Rocket Design: Two Natural Language Systems; Evaluations: PET 2022 Line Printer; APF Imagination Machine; Personal Software's Desktop Plan; Universal Data Entry System.

Vol. 6, No. 6—June 1980

Fourteen Graphics Articles: Polar Plots, 3-D Graphics, Animation, Graphic Mazes, Motion Simulation, Inside Space Invaders. 7 Music Articles: Digital Audio, Computer-Aided Sight Reading, Design of a Synthesizer, Digital Enhancement of Old Recordings. Comparison of Printers: Evaluations. The Atari Machine; Neelco's Music Box for the PET; HeathKit-Thomas Electronic Organ Kit.

Vol. 6, No. 7—July 1980

Four Articles on Adventure Games: Dragon, Dungeon. How to Fit a Large Program into a Small Machine. How to Write an Adventure. 6 Simulation Features: Genetics, Electric Management, Medical, Ecological, Sports. Self-Reproducing Programs; Man-Machine Dialogs; Selecting a Computer Dealer. Evaluations: Super-Text vs. Easy Writer; Mountain Hardware ROM PLUS+; Toolkit for the Pet; Chart Comparing Basics of 8 Popular Computers.

Vol. 6, No. 8—August 1980

Games Features: Computer Bismarck, Knight's Tour Games, My Animal, Turnabluck Game, Fifteen and Hot, Mind Exerciser, Marketing Your Own Program; Computer Graphic Designs; Robotics Conference; Insertion Sort; Stocks and Listed Options. Evaluations: Magic Wand; VisiCalc; Beta-80; Asteroids in Space.

Vol. 6, No. 9—September 1980

Twenty Educational Applications and Features: Language Arts CAI Development, Grading Program, Computers in the Classroom, Asimov: Point of View: How to Heapsort; New Consumer Electronic Products; TRS-80 Shopping List for Schools. Evaluations: Milliken Math Sequences; Exatron Stringy Floppy; EDS Videotape Series "Little Computers See How They Run"; 8 Apple II Software Packages; Educational Packages.

Vol. 6, No. 10—October 1980

Symposium on Actor Languages and Smalltalk; Linked Merge Sort; How to Solve It, 9 New Applications and Games; Election Prediction, The Presidential Campaign. Computer Division Evaluations: OSI C2-4P Computer, TRS-80 Voshtex, Two Text Editors, Five Music Systems, 15 Software Packages, BASEX.

Vol. 6, No. 11—November 1980

Actor Languages and Smalltalk—Part 2: Effective Documentation; Bombproof Data Entry; Interactive Systems and Virtuality; Fast Sorting, Controlled Input in Basic; Loosening Packed Base, Future of Small Business Computing, Planning Your Diet. Evaluations. Electronic Games; Computer Ambush, TR Copy.

Vol. 6, No. 12—December 1980

A Comparison of Basic Systems; Busing Guides to Personal Computers and Electronic Toys and Games; Legal Protection of Computer Programs; Nuclear Power Plant Simulation; Superman Game; Logic Problem Solver; Interview with the inventor of the ZX80, Clive Sinclair; Alvin Toffler: The Electronic Cottage. Evaluations: Sinclair ZX80, Atari, Apple Pascal, CBM2022 Smart Printer, Pearl, Apple II and Apple II Plus, Pet, TRS-80.

Vol. 7, No. 1—January 1981

Graphics and Animation; Printing Without Quotes; Apple Lo-Res Shape Tables; Sorcerer Hi-and Lo-Res Graphics; Spirograph; TRS-80 Color Computer; New PETs; Intelligent Videodisc; A Library of Sound; Dithering; Educational Software and Books; Music Synthesizers; Graphics Hardware; Atari Music Composer.

Vol. 7, No. 2— Febuary 1981

Comparison of Music Editors; Artificial Intelligence: Are Computers Alive?; Genetics Simulation for the Pascal; National Programming Contest; Monster Combat; Introduction to Computer Control.

Vol. 7, No. 3— March 1981

Education: MECC In-Depth; Selecting a Computer; CAI; Prize-Winning Simulation; Commercial Software Evaluations; Fantasy Games; Show and Spell; Cutting Your Taxes; PET Word Processor; Space Invaders Championship; Microcomputers and Hyperactive Children. Realistic Simulations; 25 New Products.

Vol. 7, No. 4—April 1981

Networks and Telecommunication; Home Banking; Osborne 1; ABM; New Horizons for the Apple; Column Board Comparison; Computerized Writer; Space Games; Small Computers in Big Business.

Vol. 7, No. 5—May 1981

Buyer's Guide to Small Business Computers; Bombproof Data Entry; Personal Finance; Home Accounting; Programs for the Investor; Financial Programming Language; Short-Range Forecasting; Fuel Economy Comparison Program; Music Synthesis Past and Future.

Vol. 7, No. 6—June 1981

Graphics and Animation; Interview With Leo Christopherson; Alien; OSI; Computers of Hollywood; Colored Tapestries; Computer Warfare; Digital Music Synthesis; Hi-Res Graphics for the TRS-80; Fantasy Games Old and New; Funny Numbers; Spiderman.

Chuck Carpenter

Correspondence is always welcome and a response will be made to those accompanied by a SASE. Send your letters to: Chuck Carpenter, 2228 Montclair Pl., Carrollton, TX 75006.

Since there are many newcomers to the world of Apple II, in this month's column I will share some thoughts about getting started with an Apple. Also, as I mentioned in the July '81 column, the mini-assembler will be discussed.

Getting Started

The Apple II is one of the most versatile of all personal computers. The reasons for this versatility are many:

- Ease of expansion. Sockets for RAM (Random Access-Read/Write Memory) are built-in—so are the sockets for up to seven peripherals. There is a socket for language expansion too.
- Capacity for up to 14 disk drives. If you only want to store data you can use all seven peripheral slots for disk drives.
- Color graphics. You can choose lores in 16 colors or hi-res in seven colors. The commands to manipulate graphics are built into the programming languages.
- Programmable sound. Music synthesis and special effects are possible. Out of one little speaker you can produce the sounds of space war or symphonies (with a little imagination).
- Game paddle I/O. This is more than just a game paddle connector. You can program three inputs for such things as sensing switches. There are four output bits that can be turned on and off under program control. A program is included in Listing 1 to let you drive a printer from one of these bits. Four analog inputs are available for game paddle controls. These inputs can be used for measuring any low speed device. Or, you can use them to make temperature measurement.
- Power supply. To power all of these things there is a high-quality switching power supply. This supply, of modern design technology, will provide all the power needed to run a fully loaded Apple II. There is no need to buy another supply for most of the available add-ons.
- Languages. The standard machine (Apple II Plus) comes with Applesoft Basic in ROM (Random Access—Read Only Memory). The language is always there when you turn the machine on. You can get the very fast Apple Integer Basic too. If you want UCSD Pascal or a version of Fortran 77, these are also available. The Apple Language System supports both of these languages.

With all this flexibility, it is no wonder that so many software packages and peripherals are available for the Apple II.

Software

Software packages are available to cover most any requirement. Apple supplies several, but many, many more are available from independent sources. There is so much software, in fact, that space is not available here to list it.

One way to see some of the software packages is to visit several computer stores. Visit as many as possible because none of them carry exactly the same ones. For those of you that have to shop by mail, the ads in magazines will be helpful. Another source of software information is catalogs. One such catalog is *The Apple Software Directory* from WIDL Video, 5245 West Diversity, Chicago, IL 60639, (312) 622-9606.

Once you find some interesting software, how do you know it's any good? If you buy at a store, ask to try it. If you buy by mail, you can't do that, but most reputable companies exchange defective software.

Reviews are a good source of information. Many magazines, such as *Creative Computing*, have regular reviews of Apple software. One magazine is devoted to Apple software reviews; it is called *Peelings II*, and you can get a subscription for $15 per year by writing to POB 188, Las Cruces, NM 88004. Or, you can phone (505) 526-8364. Some back issues are available.

Hardware

Hardware accessories range from disk drives to modems for communications to printers that permanently capture the electronic word. Each requires some type of interface between the computer and the peripheral device. Again, a search through the magazines will turn-up most of the possibilities.

Disk drive controllers are the usual first hardware option. The Apple II uses its own special controller. By doing this, Apple was able to use their own format and get more data on a diskette than most other systems. The disk drives are modified Shugart SA400s. I believe they are called an SA385 since they are stripped-down somewhat. You can't use the SA400, in any event. The Apple disk system puts 143K bytes on a single sided diskette. Most other systems only allow about 80 to 90K bytes. Several companies are now making more storage capacity available.

One company, Sorento Valley Associates (SVA), makes an Apple compatible controller that lets you use 8" drives. The capacity of a standard 8" disk is 250K

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Why would anyone spend $59.95 for a joystick?

Super Joystick

Star Wars. Played with paddles, it's difficult at best and frustrating at worst. But with a joystick it becomes an entirely new experience. It's still challenging. It's also fun. And very addictive.

Have you ever used a drawing program in which one paddle controls the horizontal movement of the "brush" and the other paddle the vertical? It's slow, tedious work. But with a joystick, drawing is an absolute joy.

Exceptional Precision

The Apple high-resolution screen is divided into a matrix of 160 by 280 pixels. To do precise work on this screen, you need a precise device. Most potentiometers used in paddle controls are not quite linear. If you rotate a paddle control at a constant speed, you'll notice that the cursor speeds up slightly at the beginning and end of the paddle rotation.

The Super Joystick has a pure resistive circuit which is absolutely linear within one tenth of one percent. In other words it would give you precise control over an image of 1000 by 1000 pixels, were such resolution available. Thus it is suitable for high precision professional applications as well as educational and hobbyist ones.

Matched to your application

The Super Joystick also has two external trim adjustments, one for each direction. This allows you to perfectly match the unit to your application and computer. Say you want to work in a square area instead of the rectangular screen. Just reduce the horizontal size with the trim control.

How many times have you played Space Invader and had your thumb ache for hours from the repeated button pressing? This won't happen with the Super Joystick. It's two pushbuttons are big. Moreover, they use massive contact surfaces with a life of well over 1,000,000 contacts. A few games of Super Invader using these big buttons will justify the purchase of the Super Joystick.

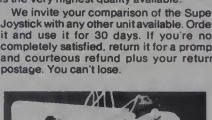
The Super Joystick is self-centering in both directions. That means when you take your hand off it, the control will return to the center. However, if you want it to stay where you leave it, self-centering may be easily disabled.

The Super Joystick plugs right into the paddle control socket and doesn't require an I/O slot.

High-quality construction

The sturdy high-impact molded plastic case of the Super Joystick matches that of the Apple computer. Every component used is the very highest quality available.

We invite your comparison of the Super Joystick with any other unit available. Order it and use it for 30 days. If you're not completely satisfied, return it for a prompt and courteous refund plus your return postage. You can't lose.



By removing two springs, self-centering can be defeated.

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Apple Cart, continued...

bytes per side. There are other companies now offering more capacity in 5 1/4" drives too—these are the newer drives that use more than 35 tracks for storage. Some drives use 40 tracks, some use 70 tracks, and some now use 80 tracks. The 40-track drives from Shugart are modified SA400s. The track-per-inch density is still the same. The 80-track drives use higher track density and require special head positioning mechanisms. Consequently, the cost of these drives is much higher. You will be seeing many new controllers and drives with much higher capacity over the next year or so, and it won't be long before some company will offer a 5 1/4" rigid that will store 6 to 10 Megabytes. It might even be Apple.

Compatibility with the Apple Disk Operating System (DOS) is always a question. The only way to know for sure is to try your software on one of these systems. Most of the people that I know who have the SVA system, for instance, have had good luck with it. It's been around the longest. Check out the system of interest first. If the company has been in business for a couple of years they are probably doing a good job.

Printers

One peripheral that always causes confusion is the printer. There are so many types and sizes now that it is difficult to know where to start. Some of the options are: parallel or serial interface, dot matrix print font or formed character font, friction feed or tractor feed, upper case characters only or lower case with descenders. And, the list goes on and on.

Parallel interface printers send the character from the computer to the printer as a complete character. Serial printers send the character as a stream of data one element of the character at a time. Parallel printers require interface control called handshaking. Handshaking signals are used to tell the computer that the printer can accept characters into its input buffer. When the buffer is full, the computer is signaled to stop sending. The printer then prints out the characters and signals the computer that it is ready for more characters. The data can be transmitted to the printer as fast as the computer can send it.

Note that it is of no use to send the data faster than the printer can print it. An operating system that allows "spooling" or the equivalent is needed. Spooling is a technique for dumping the output to be printed into a special buffer storage area. The printing is done from the buffer while the computer goes off and does other things for the operator. The Apple operating system is not that sophisticated. You must wait for printing to be completed before you can do another task.

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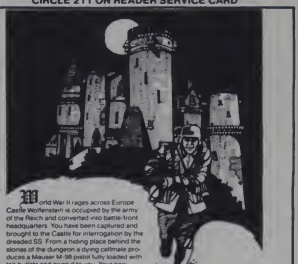

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                        1170
                        1180 *   MAIN PROGRAM
                        1190
0360- 84 35             1200 PRINTR STY YSAV1   CONTENTS OF Y
0362- 48                1210         PHA
0363- 20 7C 03          1220         JSR TOGGLE
0366- 68                1230         PLA
0367- C9 8D             1240         CMP #$8D    CARRIAGE RET.
0369- D0 0C             1250         BNE COUT
036B- A9 8A             1260         LDA #$8A    LINE FEED
036D- 20 7C 03          1270         JSR TOGGLE
0370- A9 58             1280         LDA #$58
0372- 20 A8 FC          1290         JSR DELAY   DELAY SOME
0375- A9 8D             1300         LDA #$8D    CARRIAGE RET.
0377- A4 35             1310 COUT    LDY YSAV1   GET Y VALUE
0379- 4C F0 FD          1320         JMP CHROUT  PRINT CHAR.
037C- A0 0E             1330 TOGGLE LDY #$0E
037E- 18                1340         CLC
037F- 48                1350 PUSH    PHA
0380- B0 05             1360         BCS TOGGL1
0382- AD 58 C0          1370         LDA MARK    MARK OUT
0385- 90 03             1380         BCC RATE
0387- AD 59 C0          1390 TOGGL1 LDA SPACE   SPACE OUT
038A- A9 03             1400 RATE    LDA #$03    BAUD RATE
                        1410
                        1420 * $03=110  $4D=300
                        1430
038C- 48                1440 PUSH1   PHA
038D- A9 20             1450         LDA #$20
038F- 4A                1460 SHIFT   LSR
0390- 90 FD             1470         BCC SHIFT
0392- 68                1480         PLA
0393- E9 01             1490         SBC #$01
0395- D0 F5             1500         BNE PUSH1
0397- 68                1510         PLA
0398- 6A                1520         RDR
0399- 88                1530         DEY
039A- D0 E3             1540         BNE PUSH
039C- 60                1550         RTS
                        1560
                        1570 * START PRINTER
                        1580
039D- A9 60             1590 PRTON   LDA #PRINTR
039F- 85 36             1600         STA PRINTL
03A1- A9 03             1610         LDA /PRINTR
03A3- 85 37             1620         STA PRINTH
03A5- 4C EA 03          1630         JMP PRTOOS
                        1640
                        1650         .EN

SYMBOL TABLE
FDF0- CHROUT
0377- COUT
FCA8- DELAY
C058- MARK
0037- PRINTH
0036- PRINTL
0360- PRINTR
03EA- PRTOOS
039D- PRTON
037F- PUSH
038C- PUSH1
038A- RATE
0390- SHIFT
C059- SPACE
0387- TOGGL1
037C- TOGGLE
0035- YSAV1
]
```

Hex Code

Listing 1. Assembly of printer drive program in the format of the S-C ASSEMBLER II. Enter the hex code starting at address $0360 and ending at address $03A7. For some printers the mark and space addresses at $C058 and $C059 may need to be reversed. Load the program using APPLE Monitor commands. Run it with a 39DG from the monitor or a CALL 925 from a Basic program. Change the baud rate as shown in Line 1400 for 110 or 300 baud.

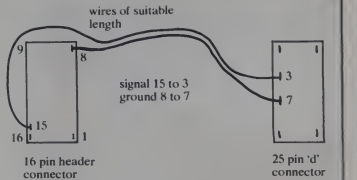

Figure 1. Connections from the 16 pin Apple game I/O connector to a TTL compatible serial printer. Use the program in Listing 1 to drive a printer connected as shown.

Serial printers are usually described as having an RS-232 interface. This interface defines the characteristics of the signals and the pins used for the signal and handshaking lines. Connectors for RS-232 compatible signals and handshaking are usually the 25-pin D type. Most printers use this configuration but not all. Serial printers often do not require handshaking to print. The electronics and printing mechanisms are designed to allow printing at some maximum speed. The head will actually move faster but the speed is controlled to allow for carriage returns without buffer overflow. If this were not done, some characters would be lost during the carriage return time. If you want to run the serial printer at maximum speed, handshaking is required. Typical speed of current printers is 30 to 45 characters per second. This is often translated as 300 to 450 baud. A baud is a transmission rate of so many bits of serial data in a given time period. Current use of the more or less outdated term is 10 bits per character.

Often too, the serial printer will allow simple interfacing to the computer. Many times, I have used a simple driver program to drive my DEC LA-34 from the game paddle connector. If the printer input uses modern electronics, it is often what is called TTL (Transistor Transistor Logic) compatible. These are the output voltages available from the game paddle I/O (input-

Apple II sensational software

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Trucker and Streets of the City

CS 4710 Applesoft Disk (32K) $24 95

Trucker

This program simulates coast-to-coast trips by an independent trucker hauling various cargos The user may haul oranges, freight or U.S. mail All have different risks and rewards Maximum profit comes from prudent risk-taking

If all goes well, you can obey the speed limits, stop for eight hours of sleep each night and still meet the schedule Bad weather, road construction or flat tires may put you behind schedule You may try to increase your profit by skimping on sleep, driving fast or carrying an overweight load

Other factors are choice of routes, truck payments, fuel, food, tolls and fines The simulation is engrossing and informative

Streets of the City

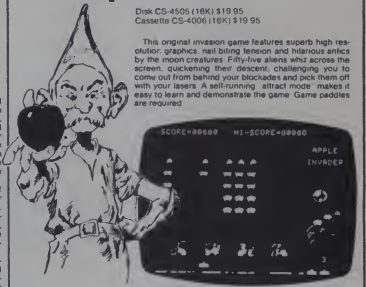
This simulation is modeled on Grand Rapids, Michigan, a metropolitan area with a population of 550,000. The budgeting, cost and work standard bases are derived from actual experiences of the city over the past five years The objective of the simulation is to complete a ten-year plan of street and transit improvements while retaining the support of a majority of the City Commission.

During your tenure, you must construct streets and Interstate highways, repair existing streets, and improve traffic safety. For the Transit Authority you have to upgrade and replace a delapidated bus fleet, increase ridership, reduce maintenance downtime and improve on-shedule performance

Other factors to be considered are operating tax levies, construction bonding and labor negotiations The simulation provides a substantial challenge and it is both educational and entertaining

Super Invasion

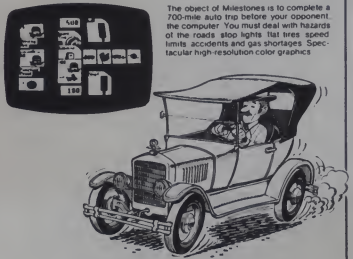
Disk CS-4505 (16K) $19 95
Cassette CS-4006 (16K) $19 95



This original invasion game features superb high resolution graphics, nail biting tension and hilarious antics by the moon creatures Fifty-five aliens whiz across the screen, quickening their descent, challenging you to come out from behind your blockades and pick them off with your lasers A self-running 'attract mode' makes it easy to learn and demonstrate the game Game paddles are required

Milestones

Disk CS-4515 (48K) $19 95
Cassette CS-4015 (48K) $11 95



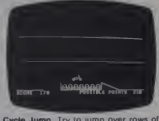
The object of Milestones is to complete a 700-mile auto trip before your opponent. the computer You must deal with hazards of the roads stop lights flat tires speed limits accidents and gas shortages Spectacular high-resolution color graphics

Action and Bumping Games

Disk CS-4516 (16K) $24 95

Action Games Cassette CS-4017 (16K) $11 95
Bumping Games Cassette CS-4070 (16K) $11 95

Hustle Earn points by chasing and tagging the elusive colored blocks



Cycle Jump Try to jump over rows of cars, buses and trucks

Road Machine Drive over a curving, mountain road as fast as possible Eight skill levels

Mine Rover Use your rover to cross a mine field with moving miners

Bumper Blocks An absorbing game of evasion and collision Five skill levels

Obstacle Course This multi-level course includes hurdles, ladders, tires and penalty areas Different every time

Stock & Options Analysis

Disk CS-4801, $99 95
Requires 32K Applesoft or Apple II Plus

This is a comprehenave set of four programs for the investment strategy of hedging listed options against common stocks. A complete description is in the TRS-80 section

Advanced Air Traffic Controller

Disk CS-4517 (16K) $19 95
Cassette CS-4008
(16K, regular version) $11 95

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output) pins. Figure 1 shows how to make the connections. A program to drive a serial TTL-compatible printer is shown in Listing 1. With this program, you never have to be concerned with the effect of tabs. Many of the interface boards, including Apple's, have problems with tabs that have to be handled with a special code. This program prints just what is in the code. It can also be used as a slow-list program.

Enter the hex code using the Apple monitor commands. These can be found on pages 40 to 66 of the Apple II Reference Manual. Specifically, use the instructions on pages 43 and 44. The program will run from the monitor using the instruction 39DG (RETURN). From a Basic program use CALL 925. To change the speed of the program, change the byte of data at location $038B. Notice that the value in the program is $D3. (The $ symbol is used to mean a hexadecimal number in 6502 microprocessor notation.) Change this value to $4D if your printer runs at 30 characters per second—or 300 baud. For higher speeds use smaller numbers. (This is the timing loop value for the delay between character elements.)

Other Features

Most of the less expensive printers use what is called a dot matrix. Each character is formed by an arrangement of dots. These dots are in a fixed pattern and are made by individual wires striking the paper through an inked ribbon. The dot matrix is often in a 5 x 7 or 7 x 9 arrangement. There are also special arrangements such as the N x 9 pattern used by my Centronics 737 printer. This arrangement is used for the proportional spacing feature.

Formed characters are found on the more expensive printers. The Xerox, NEC and similar printers are examples. A formed character is like that found on a typewriter. When the hammer strikes the paper a complete character is printed. With the printers mentioned, the characters are on the spokes of a printwheel. These spoked wheels are often called daisy wheels. Hence the term "Daisy Wheel Printers." Printers of the formed character type give much better quality print and are much more expensive. Note that some matrix printers do not have descenders. That is, certain characters do not go below the line. This is done to save the cost of more wires in the print-head. Most of the newer printers now have descenders of sorts. This helps to make the print more readable. Also watch to see if the lower case letters are raised. Some printers do this to give the appearance of descenders. But the character is actually raised above the line to keep it within a smaller matrix.

Printers to be used for graphics almost always have to have tractor feed. Tractor feed is used to maintain the position of the paper in relation to the print head. If you try to do graphics without being able to control the position of the paper, you may get gaps in the graphics being printed. Also, be sure there is software available to drive the printer you chose for graphics. It is not a simple matter of just having a printer with individual dot control. My 737 has that capability. But, as far as I know, there is no software available to let me use it for graphics.

Other considerations to be made include the choice of thermal or regular paper. Thermal paper is used with the Apple Silentype printer, which allows you to use the various plotting programs available. But, you have to use special coated paper. It is expensive and has a finite life. If it is not handled with care, your printed listings may discolor. Any heat will break it down. Plain paper printers, on the other hand, require frequent replacement of the ribbon. If you write for publication, the editors will insist on new ribbons—frequently. If you write only casually, you can get away with a lot of things. If you insist on using the blue thermal paper remember: it is very difficult to read the stuff and it is practically impossible to reproduce it with any optical system such as photography.

Lots More

Whole columns could be devoted to each of the peripheral options available for the Apple. One significant choice would be communications. You have several choices there. One is with the Apple communications card and an acoustic

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modem. Another is with the Hayes direct coupled modem. Each has its own special features and characteristics. My system uses the Hayes modem. You can do many things, such as dial from the keyboard and have unattended answering. Electronic mail and other technologies are also within the communications realm.

Amateur radio is possible with some of the equipment available. One company offers a card to let you send and receive morse code and teletype. And, how about video monitoring and control. There are peripheral cards to let you control a 3/4" video recorder. The list goes on and on. No brief treatment such as this could cover all the possibilities. Recent issues of some Apple magazines have talked about the use of the Apple computer in the making of major science fiction films, and, the Apple has been used in space exploration applications too.

Information Sources

Softalk magazine is available to all Apple owners in the USA. If you are not getting your complimentary subscription, contact Softalk Publishing Inc., 11021 Magnolia Blvd., North Hollywood, CA 91601. (213) 980-5074.

Other magazines for Apple owners include:

- *Nibble*, Box 325, Lincoln, MA 01773. $17.50 for 8 issues.
- *Call-APPLE*, 304 Main Ave. S., Suite 300, Renton, WA 98055. Membership required. $25 one-time application fee; $15 yearly dues.

Other useful publications about the Apple include:

- *Beneath Apple DOS* by Don Worth and Peter Lechner, Quality Software, 6660 Reseda Blvd., Suite 105, Reseda, CA 91335. (213) 344-6599. An in-depth analysis of Apple DOS. Covers all versions of DOS concentrating on DOS 3.3. Sells for about $22 and is well worth the price.
- *Computer Station's Programmers Handbook to the Apple II*. Complete summary of all Apple commands. Includes DOS, Assembler/Editor, Basics, Pascal, Visicalc, CP/M, Basic-80, and much more. A useful reference for the serious Apple II programmer. About $20.
- *The Apple Monitor Peeled* by William E. Dougherty, 14349 San Jose St., Mission Hills, CA 91345. (213) 896-6553. Covers all the calls and subroutines in the Apple Monitor. Also useful for the serious Apple programmer. Especially if you're interested in assembly/machine language programming. About $10.
- *Apple Machine Language* by Don Inman and Kurt Inman. Reston Publishing Co. Inc., Reston, VA. This book covers the fundamentals of assembly language programming from an Apple point of view. Basic programs are used to explain machine language. The content is specifically Apple and covers the mini-assembler. I got my copy from a local computer store for about $20.

And Lots More

My intent here was to give the newcomer and potential owner some help with sources of Apple information. There was also an attempt to explain some of the more confusing aspects of peripherals. Please write to me if you have any questions. There is so much to be covered that I could not possibly do it here. Perhaps your imagination has been stimulated though and that's good.

NEXT TIME

Lots of you wrote to me about the space problem with hi-res graphics also mentioned in the May '81 column. There were too many to mention each one. I'll summarize them and give credit to all. A couple responses included elaborate programs for helping to get more space for hi-res programs. But that's enough until next time. □

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outpost : atari

David and
Sandy Small

Recently I received a letter from a new Atari user. In it, the writer said "Help! My friends with Apples are making fun of me and my 'Aturkey 800,' as they call it. They say it can't display more than five colors onscreen at once and their Apples can. They call me up at 4:00 a.m. to tease me. Can you help?"

Well, I couldn't ignore such a plea. So here it is, the first of a two-part column on making your Atari generate many different shades of color on the same TV frame. Along the way, I'm going to cover very briefly topics that have been covered in previous columns (i.e., what is a display list?). Expect them to be just briefly defined, for there isn't room to cover them again. Rather, I'll concentrate on new topics, in a ground-up approach to color generation on the Atari. Hopefully I'll leave you with a wider knowledge of how the machine generates color, with a few example programs to show you just how much it can do.

The Atari is, in my opinion, far and away the finest graphics machine available for the price. It was designed by the wizards of Atari to be able to create as many TV displays as you can imagine. The designers knew that many new applications would be thought of long after the hardware was designed, and thus made everything as open ended as possible with a great deal of flexibility. (I suspect a stripped-down Atari 800 resides inside many Atari coin-op games.)

"Wait a minute," you say, "what's this about 'flexible' and 'open ended?' The Basic book says, five colors maximum. That's not very flexible."

Let's discuss how the Atari handles color a bit, understand why there's a five color limit, and then get around it using some of the flexibility designed into this machine. One demonstration program will show 128 shades of color on the same screen! This demo has been seen by few people indeed. Along the way, I'll even provide a nifty demonstration program called "Sunset."

Why Five Colors?

When the designers of the Atari worked out the details of its color handling, they decided on a technique which would give the user as much flexibility as possible, rather than locking him into just one method.

Inside the Atari is stored a copy of what's currently going on the TV screen, this is called "display memory." For a given point, or a group of points onscreen, some way of determining the color to be used when plotting must be stored in this memory. In the Atari the color information is stored in a "color register." When in display memory the color of a point is specified, a color register number is stored rather than the actual color code.

In other words, to plot a red point, one tells the display memory that this point will be plotted in the color and brightness stored in (say) color register 1, then one puts color red at some brightness into that color register. See Diagram 1.

```
10 REM PROGRAM #1. COUNTS THROUGH
20 REM ALL POSSIBLE COLORS.
25 POKE 709,14:REM SHADOW REGISTER
30 FOR C=0 TO 255 STEP 2
40 POKE 710,C:REM SHADOW REGISTER
50 PRINT "COLOR REGISTER=";C
60 FOR DELAY=1 TO 100:NEXT DELAY
70 NEXT C
```

Program 1.

There are five available color registers, numbered 0 through 4. Color register 4 is also known as the "background color register." It specifies the color and intensity for any place onscreen where nothing else is written. (In the Graphics modes 3-7, this means the color of the area between any plotted pixels; in mode 0, it means the area around the character display field, not the area "behind" characters. It's the border area.)

This approach may seem more complex than necessary, but it has its advantages. First, it saves memory: only two bits at most are required to specify the color of a pixel in the display memory. Second, it adds flexibility. All we have to do to change the color of every point onscreen using the same color register is modify that register—one POKE. To turn the entire screen red, then black, ("RED ALERT!"), we need only two POKEs. In a machine without the Atari's sophistication, massive and slow rewrites of display memory would be required. See what I mean about leaving the Atari open ended for applications that would be thought of after the machine was designed?

Color registers are one byte long. The upper four bits determine the color (0-15), the lower four specify the brightness. Now only the top three of the four brightness bits are used; hence, there are eight levels of brightness, and 16 colors, or 128 possible total shades of color. Note that in this register, values 0-15 are color 0 in

Value	Color
0	Grey
1	Gold or Light Orange
2	Orange
3	Red-Orange
4	Pink
5	Blue
6	Purple-Blue
7	Blue
8	Blue
9	Light Blue
10	Turquoise
11	Green-Blue
12	Green
13	Yellow-Green
14	Orange-Green
15	Light Orange

Table 1. Color Register Values (as stored in upper 4 bits of color register).

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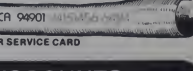

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different intensities. 16-31 are color 1, and so on; if we just count this register upwards, we'll pass through all 16 colors, each increasing in intensity to the highest level before moving on to the next. If you'll run Program 1, you'll see the screen counted through all the different shades. Table 1 lists the different colors.

How Basic Handles Colors

Up in high memory there's some memory which isn't read-write, regular old RAM. Rather, when one writes or reads from these locations, one is communicating with other chips in the Atari which help support the 6502 (more on this later). (Diagram 2.) Anyway, one chip, called CTIA, handles colors and graphics generation. There are five locations ("hardware color register addresses"), which are the five color registers. Now CTIA looks to these registers to find out the color needed for a given character/point, whenever it plots a new point. During the refresh process of updating the screen, it looks to the registers many, many times, fetching the colors for displayed data.

The operating system maintains five "shadow registers." These are normal RAM memory locations. At the beginning of each screen refresh, these five color shadow registers are copied into the corresponding five hardware locations. Basic deals with these shadow registers. (A list of these also appeared in a previous article.) Why?

One reason for maintaining these shadows is that the CTIA color register locations are "write only"; one cannot read out those locations the color has just written in. Remember, they are not memory locations; they are other chips to which we write by POKEing simulated memory locations. Hence, if we wanted to read a color register and we didn't have it stored somewhere (like a shadow register), we couldn't. Being able to read registers is handy, for example, rotating a color from one register to the next; you use the O.S. shadow registers for this.

Basic's SETCOLOR (color reg number), (col number), (lum number) takes: (16 x color number) + lum and POKES that value into the O.S. shadow register. One sixtieth of a second later, at the beginning of a screen refresh, the O.S. copies this value into the CTIA hardware color registers and begins to use it for plotting data onscreen. Incidentally, a direct POKE to the O.S. shadow locations is equivalent to a setcolor. For example, SETCOLOR 2, 4, 10 is the same as: POKE 710, (4*16)+10.

The designers of Basic also had to come up with some means for the user to specify what color a given point or character should be. For this they have the COLOR

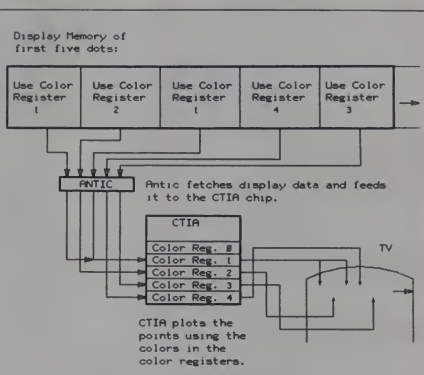
Display Memory of first five dots:
Use Color Register 1
Use Color Register 2
Use Color Register 1
Use Color Register 4
Use Color Register 3
ANTIC
Antic fetches display data and feeds it to the CTIA chip.
CTIA
Color Reg. 0
Color Reg. 1
Color Reg. 2
Color Reg. 3
Color Reg. 4
TV
CTIA plots the points using the colors in the color registers.

Diagram 1. Specifying a Color Indirectly.

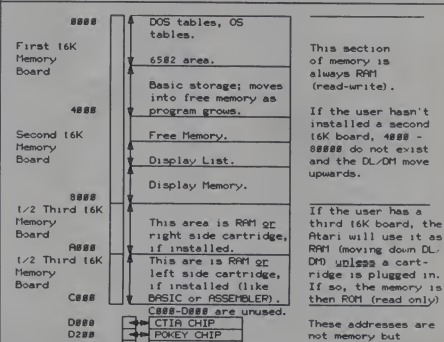
8000
First 16K Memory Board
DOS tables, OS tables.
6502 area.
Basic storage; moves into free memory as program grows.
4000
Second 16K Memory Board
Free Memory.
Display List.
Display Memory.
8000
1/2 Third 16K Memory Board
This area is RAM or right side cartridge, if installed.
A000
1/2 Third 16K Memory Board
This are is RAM or left side cartridge, if installed (like BASIC or ASSEMBLER).
C000
C000-D000 are unused.
D000
CTIA CHIP
D200
POKEY CHIP
D300
PIA CHIP
D400
ANTIC CHIP
E000
Operating System ROM cartridge.
FFFF
This section of memory is always RAM (read-write).
If the user hasn't installed a second 16K board, 4000 - 8000 do not exist and the DL/DM move upwards.
If the user has a third 16K board, the Atari will use it as RAM (moving down DL/DM) unless a cartridge is plugged in. If so, the memory is then ROM (read only)
These addresses are not memory but other Atari chips.
This is all ROM (read-only).

Diagram 2. Atari Memory Layout and Support Chips.

Hardware Registers (CTIA)		O.S. Locations (Shadows)	
D016	(53270)	2C4 (708)	PF0
D017	(53271)	2C5 (709)	PF1
D018	(53272)	2C6 (710)	PF2
D019	(53273)	2C7 (711)	PF3
D01A	(53274)	2C8 (712)	PF4(BACK)

Table 2. Color Registers.

Graphics Mode	Color Register	COLOR(x)
	Character Modes	
0	0 - Unused 1 - Character lum only 2 - Char backgnd color/lum 3 - Unused 4 - Border col/lum	Not used in graphics sense.
1,2	0 - 3: Character 4 - backgnd/border	Not used in graphics sense.
	Graphics Modes	
4,6: One Bit	0: Point color/lum 1, 2, 3: Unused 4: Backgnd	COLOR 1 COLOR 0
3, 5, 7: Two Bit	0: Point color/lum 1: Point color/lum	COLOR 1 COLOR 2

Table 3. COLOR # Values.

(#) statement. It specifies which color register to use when plotting data, and remains in effect until the next COLOR statement.

The argument, unfortunately, is not a color register number. The designers of Basic tried to keep the user away from bits and bytes discussions; hence the COLOR argument at first appears random. Upon closer inspection, I determined what it actually was and the reasons for its arguments.

The argument of the COLOR statement is the data that are written into display memory to specify colors. The Atari has two- and four-color graphics modes, which uses one or two bits to specify color register. For example, COLOR 0 is generally background because of a 00 written into display memory plots nothing, thereby forcing the background color to appear there. Next month we will learn how to get around it. □

Notes:

SETCOLOR (n), color, lum always sets color register n. Hence, the color register number given is equvalent to the SETCOLOR register number.

In chapter modes (0,1,2) more than 1 or 2 bits are written into display memory. Hence the COLOR argument is actually the character byte written in memory.

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rings...trs-80 strings...trs-80

Stephen B. Gray

For the 34th ride on the TRS-80 train, we'll talk about getting started with a TRS-80, look at a benchmark report on the Model II, a cassette that lets you do a print, a plastic video worksheet, a screen-print program, a word-processing program, Radio Shack's Level-I Statistical Analysis package, and a short program that creates an optical illusion.

Getting Started

I've been asked to write a "Getting Started" piece for this column. Although some of the lesser personal computers are fascinating machines, I feel that you're better off with one of the best-sellers, from a company that's had plenty of experience manufacturing and supporting their computers.

If there were no TRS-80 computers, I'd probably have an Apple, mainly because of all the wonderful peripherals available. But in my opinion, the TRS-80 is, and for the foreseeable future will be, the king of the hill in its field. There are many more publications for the TRS-80 than for any other computer, and many more software packages are available for the TRS-80 than for any other. Many of the programs are, admittedly, second- and even third-rate, but even then you have a great many to choose from. Also, if you're on a tight budget, there are more used TRS-80s around than any other machine.

As for which TRS-80 to select, more about that in a moment. As for tape versus disk, tape is cheaper, but the general movement is toward disk, and some software houses will soon, if not already, offer only disk programs. With disk, you load a program in seconds instead of minutes, and you can store much more in less space.

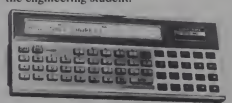
If possible, go into a computer store and try out a machine, or try out a friend's computer. Get the feel of it, try to imagine owning it, make sure you'll get enough out of it to make the investment worthwhile, and also make sure you want to spend that much time alone with a machine.

Which TRS-80 For You?

When you get to the point of selecting a TRS-80, it's not all that complicated. They fall into rather easily defined user slots, so there usually isn't much of a problem deciding which to buy.

Pocket Computer

As I wrote previously (June 1981, p. 196), the TRS-80 Pocket Computer is mainly for the gadgeteer (who wants one because it's such a clever little piece of engineering), the man on the road (who hasn't space for a table-top micro), and the engineering student.



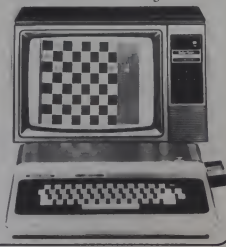
Despite the small keyboard and small, fixed memory, the PC packs a lot of computing power in a small space. One problem: so far, Radio Shack, hasn't provided much software for the PC. And unless the few companies that write programs for the PC generate something other than games and mortgage-payment-type software, you may have to write your own applications software. However, that's the best way to really learn how your PC works and how to use it; you'll be surprised how complex a program you can write if you really have to.

Model II

This is an easy one, because just about everybody who buys a Model II TRS-80 intends to use it for business. That's the way Radio Shack markets it, offering several business-system combination packages, and nothing but "Ready-to-Use Model II Business Software," as the RSC-5 catalog puts it.

Color Computer

The TRS-80 Color Computer seems mainly intended for game players, what with its "instant-load Program Paks"



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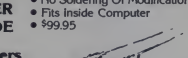

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TRS-80, continued...

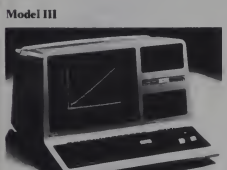
designed to compete with the load-and-go capability of the Atari and other such machines (Creative, July 1981, p. 208).

Yet the 16K Color Basic provides many functions that go beyond the needs of the graphics enthusiast, who might seem one of the main targets for the high-resolution CC graphics.

The CC's low display-character density, which is only 38 percent that of a black-and-white TRS-80 screen, makes the CC less suitable for business use and for writing long programs.

All in all, the CC seems best suited to graphics, to programmers who want to try out a TRS-80 based on the Motorola 6809E microprocessor, and to writers who want to generate books and programs that go beyond Radio Shack's efforts.

Model III



Ever since Radio Shack stopped manufacturing the Model I (although I've heard it's still being made, for sale outside the U.S.A.), the Model III has become the standard TRS-80, not only for the hobbyist, but for the small-business man who can't afford the Model II, which begins at $3,450.

Although some users might prefer a separate keyboard that can be placed where most comfortable, the Model III's self-contained keyboard and dual disk drives do help reduce costs by cutting down on cabling and cabinetry, plus making it a neater-looking machine.

For those on a tight budget, used Model I TRS-80s are advertised as low as $500 for a 16K Level-II that originally sold for about $850.

Model II Benchmark Report

The Association of Computer Users, founded several years ago by Hillel Segal, is a membership organization offering a monthly *ACU Bulletin*, a bimonthly *Interactive Computer Journal*, and unlimited phone-in reference service, for an annual fee of $50.

The fee also includes membership in one of ACU's seven sections, each of which has its own bimonthly newsletter: Large Computers, Small Computers, Distributed Processing, Word Processing, Midi Computers, Time-Sharing, and Home & Hobbyist.

The fee also includes two free Benchmark Reports, which come in three series: popular computers under $15,000; single-user systems in the $15,000 to $25,000 range; and multiple-user systems.

Reports published in the first series include the Northstar Horizon, Apple II Plus, Pertec PCC 2000, Radio Shack TRS-80 Model II, etc., for a total of twelve.

The report on the TRS-80 Model II, dated July 1980, covers 22 pages, including an overall summary; summary of benchmark results; benchmarks; details on pricing, hardware, software and support; summary of user comments; and conclusions.

The summary says the benchmark tests "place the Model II in the middle of the times recorded for the 18 systems tested in ACU's Series 1 and Series 2 prepared so far." The Line Printer III "was found to be very efficient and convenient."

All the summary comments are laudatory, including "the extensive popularity of the Radio Shack Model I systems seems to be instrumental in getting small users to integrate the Model II into their businesses" and "The Model II can be configured to satisfy a variety of uses, and many cited the ability to gradually expand the Model II system as their needs grow as a strong selling point for the system."

The benchmark tests are meaningful, of course, only when compared with benchmarks run on other computers. The test section takes up eight pages, covering speed tests (both CPU and I/O intensive), "real-life" problems (scientific/engineering, new product planning, accounts receivable), and ease-of-use tests.

Comments on setting up the Model II and running the tests are many and detailed. The setup/initialization procedure was found to be "simplified by the clear step-by-step instructions in the manual" and the "handy, concise and well-organized quick reference card" to be "extremely useful as a check list and reference for the new user."

The Basic Reference Manual "we found to be an excellent guide in making our program modifications" to adapt the benchmark programs to Model II Basic, mainly in the area of input/output.

The report mentions some of the TRS-80 Basic features appreciated by programmers, including direct and sequential access files, and assembly-language subroutine calls.

Radio Shack in-house programmers "streamlined some of the benchmark programs, and their comparative results are shown in this report. Their changes basically consisted of defining variables as integers when possible, and defeating the normally operating verify function."

The ease-of-use test results noted that "Approximately 191 keystrokes were required to edit a nine-record test file" and commented "The line editor was found to be extremely easy to use although somewhat inefficient in terms of required keystrokes."

The next eight pages provide information on pricing or hardware or software, followed by ACU observations and user comments.

A user comment on pricing: "Radio Shack is really going for that small business user. When you compare price, TRS ranks way up there." ACU's observation on Line Printer III is that its "somewhat noisy operation... can be distracting at times," then counters with: "but this minor drawback is easily overshadowed by the printer's other features, such as the software-selectable line and print densities.

An observation on software packages: "Radio Shack is moving towards offering software tailored specifically for multi-drive system configuration."

The Summary of User Comments says, "User acceptance of the [software] packages was uniformly good, particularly considering that they were not custom-designed and occasional minor problems had to be worked out."

The last sentence of the report says: "Overall we feel that Radio Shack, in combining aggressive marketing with a quality, cost-effective product, is successfully competing in the small-computer market."

These are only a very few excerpts from the Benchmark Report, which deserves to be read in full, and compared with Benchmark Reports on other computers you may be considering for business use. The complete Series 1 is $150 for the twelve reports, available individually for $25 each, from the Association of Computer Users, 4800 Riverbend Road, P.O. Box 9003, Boulder, CO 80301.

The ACU report is almost entirely full of praise for the Model II TRS-80, which could mean either that it's a fine computer, or that the ACU's policy is "Be a Booster, Not a Knocker."

Hillel Segal's comment on this is "That's not so! We certainly 'tell it like it is' from a user point of view. In fact, many of our reports contain negative comments—but when we're impressed we say so. In short, we liked the TRS-80 Model II."

3M CRT Filters

Because of a missing line in the item on the two 3M CRT filters in the August column (p. 192), the meaning was garbled. The paragraph should have read:

"The filters advertised in personal-computer magazines cost considerably less than $20.55 each, more like $13.95 or even $7.95. However, the couple I've seen

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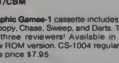

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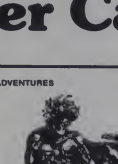
ADVENTURES



Adventureland will excite you as you search for treasures on a deserted island, or so you think! Available for the 16K Apple II or Apple II Plus (CS-4011), or the Sorcerer (CS-5003), list $14.95, sale price $11.95.

Pirate Adventure takes you from your London flat to try to recover Long John Silver's buried treasure Available for the 16K Apple II or the Apple II Plus (CS-4012), TRS-80 (CS-3008) or the Sorcerer (CS-5004) List $14.95, sale price $11.95

Your **Mission Impossible**, if you decide to accept it, is to save the world's first nuclear reactor from doom. Available for the 16K Apple II or the Apple II Plus (CS-4013), or the Sorcerer (CS-5005). List $14.95, sale price $11.95.

Wander through the **Voodoo Castle** in search of the secret of Count Cristo, but beware the Voodoo man Available for the 16K Apple II or the Apple II Plus (CS-4014), TRS-80 (CS-3010) or the Sorcerer (CS-5006) List $14.95 sale price $11.95

Beware **The Count** as you move through the haunted castle looking for clues to allow you to escape unharmed. Available for the 16K TRS-80 (CS-3011), or the Sorcerer (CS-5007). List $14.95, sale price $11.95.

Other suppliers are raising the price on these programs to $19.95. Save 50% with this never-to-be-repeated offer while supplies last!

Apple II
CS-4011 Adventureland
CS-4012 Pirate Adventure
CS-4013 Mission Impossible
CS-4014 Voodoo Castle
Package price $39.95

Sorcerer
CS-5003 Adventureland
CS-5004 Pirate Adventure
CS-5005 Mission Impossible
CS-5006 Voodoo Castle
CS-5007 The Count
Package price $49.95

TRS-80
CS-3008 Pirate Adventure
CS-3010 Voodoo Castle
CS-3011 The Count

Package Price $26.95

TRS-80

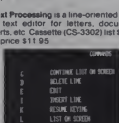
Space Games includes Star Lanes, Romulan, Star Wars and Ultra Trek. Cassette (CS-3002) list $11.95, sale price $9.49

Strategy Games includes Evasion, Tunnel Vision, Motor Racing, Jigsaw, and The Masters One of our most popular cassettes! Cassette (CS-3005) list $11.95, sale price $9.49

Battle Games includes Gunner, Sub Hunt, Tank Battle, and Getacross. Rave reviews of this package. Cassette (CS-3012) list $11.95, sale price $9.49

Deep Space Games includes three challenging games Space Lifeboat, Asteroids, and Galaxy I Cassette (CS-3013) list $11.95, sale price $9.49

Text Processing is a line-oriented simplified text editor for letters, documents, reports, etc Cassette (CS-3302) list $14.95, sale price $11.95.



Checking Account is a home budgeting system that keeps track of individual checks, payees, etc Cassette (CS-3304) list $14.95, sale price $9.49

IQ Test is a valid 60 question IQ test with a machine language scoring routine that defies cheating Cassette (CS-3203) list $14.95, sale price $11.95.

TRS-80 Sale
Pick any four packages for $29.95. Take all seven for $49.00

SOL-20

Air Traffic Controller simulates, in real time, the actions and responsibilities of an air traffic controller. Cassette (CS-8001) list $11.95, sale price $9.50.

Space Games includes Asteroids, Lunar, Star Wars, and Romulan. Cassette (CS-8003) list $11.95, sale price $9.50.

Strategy Games includes Wumpus I, Wumpus II, Trap, Race and Kingdom. Our most popular Sol package. Cassette (CS-8004) list $11.95, sale price $9.50.

Reading Comprehension will help students to learn the skills needed to master good reading habits Available in a five-cassette package for $50.00, sale price $39.95.

Game Sale
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CS-8003 Space Games
CS-8004 Strategy Games
Package price $24.95

APPLE Games Sale

Space Games-1 includes four games by Bob Bishop Saucer Invasion, Rocket Pilot, Star Wars, and Dynamic Bouncer Available in Integer and Applesoft version (CS-4001) list $11.95, sale price $9.49

Sports Games-1 includes Baseball, Breakout, Torpedo Alley and Darts Available in Integer version ONLY (CS-4002) list $11.95, sale price $9.49

Strategy Games includes Blockade, UFO, Skunk, Genius and Checkers. Available in Integer version ONLY (CS-4003) list $11.95, sale price $9.49

Brain Games includes Dodgem, Nuclear Reaction, Parrot, Dueling Digits, Midpoints, Lines, and Tones Available in Integer version ONLY (CS-4004) list $11.95, sale price $9.49

Haunted House is a nightmare simulation leaving you only six hours to find the secret passage leading out of the many room mansion. Available in integer version ONLY (CS-4005) list $11.95, sale price $9.49

Space Wars is a version of a classic MIT game redesigned for the Apple. Available in Integer and Applesoft version (CS-4009) list $14.95, sale price $11.95

Outdoor Games includes Forest Fire, Fishing Trip, Treasure Island I and Treasure Island II Available in Integer version ONLY (CS-4010) list $14.95, sale price $11.95.

Know Yourself includes Alcohol, Sex Role, Life Expectancy, Psychotherapy, and Computer Literacy Available in Integer version ONLY (CS-4301) list $11.95, sale price $9.49

INTEGER SALE
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at those prices were flat and rectangular. The 3M filters are cut to the 'bulgy rectangle' shape of the screen, with rounded corners, and are also curved convexly to fit as closely as possible to the screen, for maximum legibility."

LPRINT a Picture

A short cassette program from En-Joy Computer Programs (P.O. Box 1535, Goleta, CA 93116) lets you do a screen print with your Model I Level-II disk or tape system.

For $5, you can LPRINT any graphics display on the screen, without the need for a screen printer such as Radio Shack's long-discontinued $599 model.

The program slowly scans the video memory, comparing adjacent pairs of graphics blocks. If both are on, an equal sign is printed. If only one of the pair is on, a single-quote is printed.

Numbers, and signs such as #$%*@, are printed as they appear in the display. The program should also print the alphabet as it appears in the display, but doesn't on my system, probably because of the Radio Shack lower-case modification.

Simply merge the short LPRINT A PICTURE tape program with your Basic graphics program. Then find the last program line used to make the picture, and add a GOSUB 1, to get to the screen-print routine.

Using this program, the small box (Dec. 1980, p. 194) created by the lines

```
110 PRINT @ 412, CHR$(183)
120 PRINT @ 413, CHR$(179)
130 PRINT @ 414, CHR$(179)
140 PRINT @ 415, CHR$(187)
```

is printed out as

```
====
I  I
====
```

which is a long way from the original display: a box of solid graphics blocks. But most printers don't have any characters that look like graphics blocks.

With large pictures, especially those with many diagonal lines, the printout may not look much like the original screen display, but $5 is a lot cheaper than a screen printer.

Video Worksheet

Another useful En-Joy product is the $3.95 video worksheet, similar to the one printed on page E/1 of the Level-II TRS-80 manual, except that this one is on clear plastic.

To the top and side margins have been added the decimal and hex video-memory locations. Also on the same plastic sheet is a chart that gives all 64 combinations of the six blocks making up the graphics characters.

The display area of the video worksheet is 7 1/2" wide, from X=0 to X=127. If your horizontal display measures close to 7 1/2", you can use this plastic worksheet to figure out the exact location of any point on the screen, using SET, PRINT @, or POKE.

On my screen, the width of the display area is only 7 3/16", a shrinkage of about four percent, which also affects the height of the display. This shrinkage is due to the low line voltage—in my case about 110 volts—available in New York City.

Ask for the En-Joy catalog; they have programs that display ukulele, banjo, mandolin or guitar chords in time with the music, to help you play along; a hand-sign display of the alphabet for the deaf; bartender, with 84 drinks; a medical-history program, et al.

Screen Printing

Some printers, such as Radio Shack's Line Printer II, include a black rectangle in their character set. In the case of the Line Printer II, this black block is decimal 127 (hex 7F) in ASCII code.

If you have a Line Printer II, or any other printer with a black rectangle you can call up with an ASCII code, you can do a screen print that looks more like the displayed original than with the En-Joy single-quotes and apostrophes.

Simply edit the En-Joy LPRINT A PICTURE program, changing the

```
LPRINT "="
```

and

```
LPRINT " "
```

to

```
LPRINT CHR$(127)
```

which will, in the case of the four-line box program mentioned previously, print out

```
▀▀▀▀
▀  ▀
▀▀▀▀
```

The CRT displays a solid rectangle, but the printout isn't solid, because the printed block doesn't take up the full width and height of the printing position.

Note that while the top and bottom lines of the solid box on the screen are eight graphics blocks wide, the printed box is only four blocks wide. This is because the En-Joy program translates *pairs* of graphics blocks into single = or ' signs, which is required because two graphics blocks take up the same horizontal space as one printing character.

If the program didn't translate pairs of blocks into single printing characters, and if you printed out the box using eight black blocks horizontally, the box would take up twice as much space as it should.

Here's a program that will print the rectangular box with eight black boxes across:

```
1 FOR GY=0 TO 47
2 FOR GX=0 TO 127
3 IF GX=0 LPRINT
4 IF POINT(GX,GY)=-1: LPRINT
  CHR$(127);: NEXT GX,GY
5 IF POINT(GX,GY)=0: LPRINT
  " ";: NEXT GX,GY
6 RETURN
```

Merge this with the four-line box program, add

```
150 GOTO 1
```

to call up this brief screen-print routine, and the result will be

```
▀▀▀▀▀▀▀▀
▀        ▀
▀▀▀▀▀▀▀▀
```

You've got as many horizontal blocks as in the screen original, but if you try to print a whole screenful of graphics, instead of just this small box, you'll run out of horizontal space on your printer.

So it's best to stick to the modified En-Joy LPRINT A PICTURE program.

Simple Word Processor

Thomas R. Walls sent this from Hialeah, Florida:

"I wrote this simple word-processing system for all the people still typing LPRINT.

"After the program is RUN, you select the cursor you prefer. Next you input the number of characters per line and set the margin.

"If your printer has upper/lowercase, you must use the SHIFT key to print in uppercase. An uppercase lock (SHIFT up-arrow) is provided. Press the up-arrow to return to lowercase. If you don't have upper/lowercase, you don't need the shift.

"At any time, you can backspace, or your can press @ to erase the entire line. By pushing SHIFT @ you can reselect your cursor. And by backspacing past the first column, you can reselect the number of characters per line and reset the margin.

"NOTE: SHIFT @ needs to be pressed twice because of the built-in feature: it has to stop program execution.

"P.S. I use a Model I and I don't know how this program will work on a Model III."

I'll bet that four out of five of you who try this program, will find that SHIFT @ doesn't allow you to "reselect your cursor." That's because you (and I) didn't take full notice of the REM on line 350. The @ on this line isn't the same @ as on line 340, because it's a SHIFT @. Gotcha!

Stop playing games and get organized.

You spent up to $2,500 on computer hardware to make your personal life easier. You didn't spend it just for fun.

Now there's GUARDIAN — the first microcomputer software program that can truly organize your life with ultimate ease and speed.

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Plainly speaking, there's no need for special codes or computer language with GUARDIAN . . . you talk to it, and it talks right back in plain English. GUARDIAN even tells you how to enter data and correct errors with step-by-step on-line instruction through its built-in video display manual. The printed manual that comes with GUARDIAN is also complete and easy-to-understand.

Years Ahead

GUARDIAN lets you organize everything you need to do today for years to come. The single-line entries are easy to make, and can even be set to flag you several days in advance of the event.

Advance To Go

GUARDIAN is programmed to automatically advance and schedule appointments, PTA meetings, vacation schedules, tax deadlines and other activities indefinitely, until you cancel the entry. GUARDIAN's internal calendar adjusts itself from year to year.

GUARDIAN

Protects Your Interests

GUARDIAN is as easy to use as pencil and paper, but its memory can't be lost or erased by accident. System failure and operator error are protected by automatic file closure. Password protection keeps your files confidential.

GUARDIAN's disk has the storage capacity to organize up to 2,000 separate events for 200 people at the same time.

The GUARDIAN program is recommended for use with any soft disk drive system with 48k memory or more, and operates on any CP/M*-based system or the TRS 80** (Model I, II or III). Programs are available on standard 5¼- or 8-inch disk, with storage sleeve. **$119.95.**

GUARDIAN is available directly from Time Management Software, and is not sold through any store, catalog or other source. To order GUARDIAN call one of our toll-free numbers or return the order blank below.

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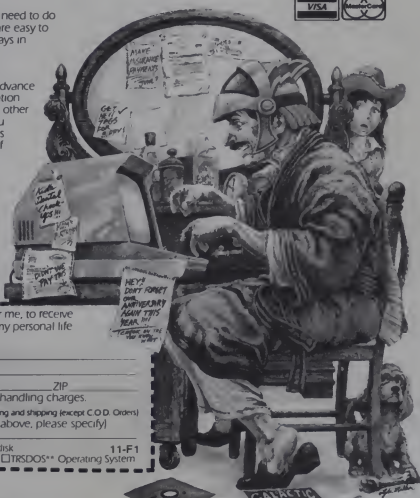
VISA



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TRS-80, continued...

```
100 CLEAR 500: CLS: PRINT @ 74, "TRS-80 WORD PROCESSOR"
110 PRINT @ 266, "PLEASE SELECT CURSOR:": PRINT
120 PRINT TAB(15) "1 ": PRINT TAB(15) "2 ": PRINT TAB(15) "3 "
130 POKE 15768,31: POKE 15832,30: POKE 15896,143
135 GOTO 180
180 A$=INKEY$: IF A$="" THEN 180
190 IF A$="1" THEN 210
193 IF A$="2" THEN 220
196 IF A$="3" THEN 230
200 GOTO 180
210 CH=95: POKE 19000,95: GOTO 240
220 CH=94: POKE 19000,94: GOTO 240
230 CH=143: POKE 19000,143: GOTO 240
240 CLS: INPUT "MAX PRINTER LINE LENGTH"; L
250 CLS: INPUT "LEFT / RIGHT MARGIN"; M
260 CLS: PRINT "READY": FOR N=1 TO 200: NEXT: CLS
270 C=-1: S=-1: B$="": A$="": CLS
280 CH=PEEK(19000): C=C+1: B$=B$+A$
290 PRINT @ 128, B$; CHR$(CH)
300 PRINT @ 40, "SPACE LEFT"; L-C-M
310 IF C>=L-(2*M) PRINT @ 30, "MARGIN"; ELSE PRINT @ 30, "      ";
320 IF C=L-M THEN 440
330 A$=INKEY$: IF A$="" THEN 330
340 IF A$="@" THEN 270
350 IF A$="@" THEN 100: REM  SHIFT @
360 IF S=1 THEN 380
370 IF (ASC(A$)<91)*(ASC(A$)>63) THEN A$=CHR$(ASC(A$)+32): GOTO 280
380 IF (ASC(A$)<128)*(ASC(A$)>95) THEN A$=CHR$(ASC(A$)-32): GOTO 280
390 IF ASC(A$)=27 PRINT @ 0, "SHIFT";: S=1: A$="": GOTO 330
400 IF ASC(A$)=91 PRINT @ 0, "      ";: S=-1: A$="": GOTO 330
410 IF ASC(A$)=13 THEN 490
420 IF ASC(A$)=8 THEN C=C-2: ON ERROR GOTO 500: Z=LEN(B$)-1: B$=LEFT$(B$,Z): A$=
"": GOTO 280
430 GOTO 280
440 PRINT @ 0, "END OF LINE.   PRINT (P) OR ERASE (E)?"
450 P$=INKEY$: IF P$="" THEN 450
460 IF P$="P" THEN 490
470 IF P$="E" THEN 270
480 GOTO 450
490 LPRINT TAB(M) B$: GOTO 270
500 CLEAR 500: GOTO 240
```

When you've filled a line, you can erase it with an E, or print it with a P. To print a line before filling it completely, just hit ENTER; to erase an incomplete line, hit @.

Because of all the computations and decisions involved between keystrokes, you can't type much faster than about 40 words a minute with this program. Any faster and you'll lose letters.

The original program put a box around the first display, and a smaller box around the three types of cursors. The boxes have been eliminated in this renumbered and slightly reworked version, because they take up a lot of program space, even though they do dress up the display.

However, this is the kind of program that can be expanded in various ways, to add default values for cursor type, printer line length, and margin setting, for example.

Statistical Analysis Level-I

Radio Shack's RSC-5 catalog lists six Model-I Level-I programs, including Statistical Analysis Level-I. There is a Level-II Advanced Statistical Analysis package, but it's on disk. So if your input is limited to cassette and you want to get into statistical analysis, simply run the Level-I program with the Program Conversion tape packed with each Level-II machine.

Load the conversion tape, which will display

LOAD TAPE & PRESS ENTER

so you put the stats tape in the cassette recorder, and the conversion program inputs the tape. When finished, the screen says

PRESS ENTER TO BEGIN

and after a pause, displays

CONVERSION COMPLETE
PRESS ENTER TO CONTINUE

and when you do, you get READY, and you're all set to RUN.

The $29.95 Statistical Analysis system consists of eight programs, loaded in four cassettes and described in a 42-page manual, all packaged in a three-ring binder.

The manual, which takes the user through each program step by step, provides the details of the five programs for describing data sets and conducting data analyses (Descriptive Statistics, Histogram, T-Test, Simple Correlation, Linear Regression), two utility programs for preparing, updating and listing data files stored on tape (Data-File Preparation, Data-File Lister), and a program that helps select data samples (Random Sample).

Appendix A shows that, with 4K of RAM memory, the maximum data-set size is 400 elements for the first three programs, and 200 pairs for the following two. With 16K, the maximum is over 3,400 elements and over 1,700 pairs, respectively.

Although four of the five programs get into areas I don't pretend to understand, the Histogram program is fairly simple. You enter data from a data file on tape, or from the keyboard—and get a BS ERROR on trying to enter the twelfth data value. So you add a DIM statement, and continue.

Several SN errors pop up next, due to semicolons in PRINT @ statements. Change the semicolons to commas, and continue.

The bar-chart display, which is quite elegant, has a couple of odd little glitches, so here's your chance to debug the conversion further, en route to statistical analysis.

Short Program #23: Drunk Snake

Robert Hankins sent a program that "produces an interesting pattern of wavy lines, and which runs on Level I or II":

```
10 FOR X=10 TO 15
20 PRINT TAB(X) "*xxx"
30 NEXT X
40 FOR X=15 TO 10 STEP -1
50 PRINT TAB(X) "xxx*
60 NEXT X
70 GOTO 10
```

The three-asterisk-wide pattern seems to weave back and forth like a drunk snake. It's an optical illusion, as you'll find out if you try to increase the number of asterisks; three is just the right number to maintain the illusion.

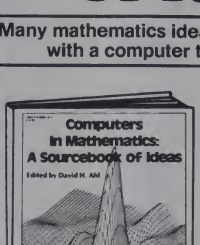
The illusion is also destroyed if you try to make the "snake" weave over a larger path by significantly increasing the 15 in lines 10 and 40. At 15, the snake really wiggles; at 20, he begins to show he's just a string of diagonal lines.

Bob didn't put his address on his letter. It may have been on the envelope, but sometimes envelopes get discarded when letters are forwarded to me. □

"Do you sell those pocket computers?"

Sourcebook of Ideas

Many mathematics ideas can be better illustrated with a computer than with a text book.



Consider Baseball cards. If there are 50 cards in a set, how many packs of bubble gum must be purchased to obtain a complete set of players? Many students will guess over 1 million packs yet on average it's only 329.

The formula to solve this problem is not easy. The computer simulation is. Yet you as a teacher probably don't have time to devise programs to illustrate concepts like this.

Between grades 1 and 12 there are 142 mathematical concepts in which the computer can play an important role. Things like arithmetic practice, X-Y coordinates, proving geometric theorems, probability, compounding and computation of pi by inscribed polygons.

Endorsed by NCTM

The National Council of Teachers of Mathematics has strongly endorsed the use of computers in the classroom. Unfortunately most textbooks have not yet responded to this endorsement and do not include programs or computer teaching techniques. You probably don't have the time to develop all these ideas either. What to do?

For the past six years, *Creative Computing* magazine has been running two or three articles per issue written by math teachers. These are classroom proven, tested ideas complete with flowcharts, programs and sample runs.

Teachers have been ordering back issues with those applications for years. However, many of these issues are now sold out or in very short supply.

So we took the most popular 134 articles and applications and reprinted them in a giant 224-page book called *Computers in Mathematics: A Sourcebook of Ideas.*

Ready-to-use-material

This book contains pragmatic, ready to use, classroom tested ideas on everything from simply binary counting to advanced techniques like multiple regression analysis and differential equations.

The book includes many activities that don't require a computer. And if you're considering expanding your computer facilities, you'll find a section on how to select a computer complete with an invaluable microcomputer comparison chart.

Another section presents over 250 problems, puzzles, and programming ideas, more than are found in most "problem collection" books.

Computers in Mathematics: A Sourcebook of Ideas is edited by David Ahl, one of the pioneers in computer education and the founder of *Creative Computing.*

The book is not cheap. It costs $15.95. However if you were to order just half of the back issues from which articles were drawn, they would cost you over $30.

Satisfaction Guaranteed

If you are teaching mathematics in any grade between 1 and 12, we're convinced you'll find this book of tremendous value. If, after receiving it and using it for 30 days you do not agree, you may return it for a full refund plus your return postage.

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CIRCLE 300 ON READER SERVICE CARD

Merlin's first Annual Summer Puzzle Contest is over and the final winners have been selected by our board of judges. As we mentioned back in the June issue each winner will receive an autographed copy of *Merlin's Puzzler, Merlin's Puzzler 2, Merlin's Puzzler 3* and *The Clue Club*, all by yours truly, and a copy of *Computer Coin Games* by Joe Weisbecker.

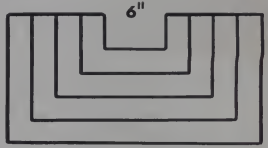
Congratulations!!! We want to thank everyone that entered the contest. To those of you that did not win, take heart, Merlin may still use your puzzle later on and send you a copy of one of his books. We would also like to thank those of you that have taken the time to tell us how much you enjoy Merlin's puzzle pages each month.

And now, the winning puzzles:

Potted Problem

Our first winner is Mr. Rick Olcott from Memphis, Tennessee. Mr. Olcott wrote a series of puzzles for the house bulletin of the Mid-South Aquarium Society between 1972 and 1977 and he was kind enough to send them along to us. His puzzles all have a fishy flavor to them and we have selected the following "Potted Problem" to receive our award:

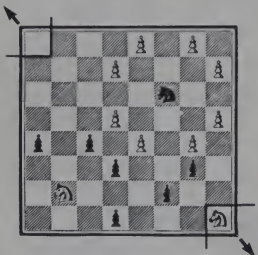
"Millard Fillbert bought a set of nesting clay pots for the waterfall rock garden he's installing in his back bedroom, and he told us that all three of the smaller pots together hold exactly as much water as the largest pot by itself. The pots are all square-bottomed, fit exactly together, and have walls and bottoms exactly one inch thick. If the smallest pot has a 6" inside edge, how much water do all the pots hold?



Cornered

Next is an interesting chessboard puzzle from Mr. Max Vrugt of Kingston, N.Y. He writes:

"I have a chessboard and 32 domino pieces. Each domino piece has the size of 2 fields of the chessboard. The 32 pieces will cover the board completely. Now I cut 2 opposite corner fields out of the chessboard. Can I still cover the board completely with 31 domino pieces?



A Punctuation Problem

Another winner is Mr. Ed Konowal of Fort Myers, Florida. You get only one chance at solving it.

"All the following sentence needs is a little punctuation to make it understandable:

THAT THAT IS IS THAT THAT IS NOT IS NOT IS THAT IT THAT IS IT.

A Matchless Puzzle

From across the sea comes our next winner, Mr. Alexander E. Yagupsky of The Hague, Holland has propounded the following puzzle:

"Forty-eight matches are divided into three piles of different amounts. If we take from the first pile the amount of matches that are in the second pile and place them with the second pile, if we then take from the second pile the amount that is in the third pile and add it to the third pile, and if we then take from the third pile the amount of matches that reside in the first pile and place them in the first pile, all three piles will have the same amount of matches; that is.16 (48/3 = 16).

How many matches were there originally in each of the three piles?"

The Problem of the Burning Candles

Mr. Murray Hayman of Silver Spring, Maryland, is our next winner. He writes:

"There are 2 candles, and one is 1 inch longer than the other. One is lit at 7:30 A.M. and the other at 8:00 A.M. Later, at 12:00 noon, they are both the same size. At 4:30 P.M. the first one goes out and at 6:00 P.M. the second one goes out. How long were the candles before they were lit?"

T	I	M	E
W	A	R	P

The Star Trek Puzzle

op into hyperspace with this winner from an old contributor, Mark Kantrowitz of Brookline, Mass. Mark has given us a Change-The-Word-Puzzle to solve. You must change the word TIME to the word WARP in 4 moves. (During each step the puzzler must change *one letter* in the *previous word* so that a new word is formed. Keep up the good work, Mark!

Another True or False Puzzle

Yes, Edward Wellen of New Rochelle, New York, has come up with another variation of the popular "Who's telling the truth and who's lying" type of puzzle. Well done Edward. His story goes like this:

"On the island of Ambivia the natives come in two hues — orange and purple. The Oranges always lie, the Purples always tell the truth. At dusk you row towards the beach, where you dimly see three figures. You shout to them: "Are you Orange or Purple?" One answers, but the tropical breeze blows the words away. A second one calls: "He says he's Purple, and he is Purple, and so am I." The third one calls: "He's Orange, but I'm Purple." What's the color of each of the three?"

What Comes Next?

Susan de Guardiola of Dallas, Texas, sends us an interesting "What Comes Next", or, fill in the blank type of puzzle. In this problem the puzzler is given a list of words. After looking the list over you must supply the next logical word that should be added to the end of the list. As always these puzzles teach us to look at a problem in more than one way. Our thanks go out to Susan for sharing this problem with us. The list of words is:

Hard, Soft, Joy, Thin, Grief, Green, Brittle, Humor, Aqua, Sour, Heavy . . .

A Counter Problem

Mr. Sheppard Yarrow of Derwood, Maryland, is our next winner. He tells us about a conversation partly overheard at the counter of a hardware store. The conversation went as follows:

"How much will one cost?"
"Twenty cents," replied the clerk in the hardware store.
"And how much will twelve cost?"
"Forty cents."
"Okay. I'll take nine hundred and twelve."
"That will be sixty cents."

The puzzle is, what was the customer buying?

An Ageless Problem

Our last winner is Scot Shinderman of Commack, New York. Scot sends us a problem involving ages that can be solved with the application of a little simple algebra (those are Scot's words). As Scot tells it:

"Mary is 24. If Mary is twice as old as Ann was, when Mary was as old as Ann, how old is Ann now?"

I hope that you all have enjoyed the puzzles we selected as the winners of "Merlin's First Annual Puzzle Contest". Here's a final puzzle from Merlin called:

A Loopy Problem

You should have a lot of fun with this puzzle. Form a one-inch wide loop of stiff paper. Place this loop on top of an empty milk bottle (or glass jar). On top of the loop, directly over the mouth of the bottle, place a dime. Your problem is to get the dime into the bottle. When doing this you are only allowed to touch the paper loop. You are also only allowed to use one hand while solving this puzzle. Also, you cannot pick the paper loop up with your fingers. (From *Merlin's Puzzler 3* by Charles Barry Townsend, Published by Hammond, Inc.) Answers on p. 286.

Well, that does it for now. I certainly enjoyed putting this issue together. If you have a puzzle or two that you would like to share with us please send it along. If Merlin uses it he will send you one of his puzzle hooks. Just address your letter to Charles Barry Townsend, 32 Hickory Drive, Maplewood, New Jersey 07040.

Until next month, good luck, and, good puzzling.

Charles Barry Townsend

m...software legal forum...s

Barry Bayer

Starting with this month's Forum, there will be several articles written by Barry Bayer from the viewpoint of a software purchaser who has had problems with the product purchased. Mr. Bayer is an attorney who practices general law in the Chicago area. —H.N.

As regular readers of this column are aware, I have long been of the opinion that microcomputer software users often come out on the short end of the stick because of unfair warranty and support policies instituted by software publishers, because of the great distance between the typical user and the typical publisher, and because of the small amount of money involved (relative, at least, to the great cost of retaining an attorney to do anything to enforce your legal rights). It is difficult to do anything about the distance (although a legal gimmick commonly called "long arm jurisdiction" may sometimes help) and next to impossible to do anything about legal fees (although another legal gimmick known as the "class action" may have some applicability).

The purpose of these remarks, therefore, is to define the relationship between the software vendor and the purchaser when there is no signed agreement, and to suggest agreements that software publishers should be expected to offer to customers who, in good faith, spend $25 to $300 for programs to play the latest game, or organize their accounts receivable. I claim no originality for any ideas presented, but readers who have never attended a law school "Contracts" course may consider this of some use.

I will be using some real examples of software advertising and documentation. But because these examples are typical and not unusually evil, it is, perhaps, unfair to single out the specific publisher involved, therefore names will be omitted. It is sufficient to say that any example used will be from a product that has been advertised in these pages, possibly in this very issue.

I will ignore the potential problems that exist because a purchaser will typically deal with a retailer and not the publisher. It will always help to deal with a reputable local retailer who will take back a product that just does not work, notwithstanding the difficulties he might have with his distributor or the publisher. It has been my experience that such retailers do exist, but may be hard to find. With the ground rules out of the way, let's begin.

I walk into a computer store, hand a clerk $100 and walk out with a receipt and a heavily advertised XYZ management and analysis package, with shrink wrap surrounding its rich looking leatherette binder. Although not one word was said about warranties or program performance, a state law, the Uniform Commercial Code, adopted almost everywhere but Louisiana sets out these provisions. (See Appendix.)

Because the product was sold by a merchant, and there was no agreement that the implied warranties would not be included in the transaction, the Seller warranted that the product was "merchantable," that is, that it is of a condition that is considered generally saleable in the business community selling that type of goods. I would think, at a minimum, that this implied warranty would include a warranty that the disk would boot, and that the program would run without crashing under normal circumstances, that it would accept reasonable input, and send reasonable output. You (or a court) might come to a different conclusion.

Let's add some facts. Assume that I walk into the store, and tell the proprietor of my intended application, and ask him to suggest a good program to suit my application. If he, as an expert in the microcomputer field, suggests and sells me the XYZ package, knowing my intended use and that I rely on his expertise, he has made an implied warranty of fitness for a particular purpose, pursuant to Section 2-315 of the UCC.

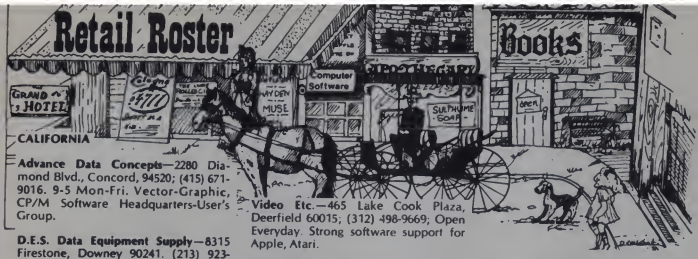
This warranty means exactly what it says. The Seller is making a statement that the program will do what I told him it would do. This warranty can be much stronger than the implied warranty of merchantability.

Applewriter, for example, is a "merchantable" word processor, but it would not fit for my purpose of writing scholarly articles with footnotes requiring superscripts and would not interface with my printer which uses proportional microspacing. If I had asked the Seller for a word processor that would do all these things, there would be an implied warranty of fitness that the program sold to me would do them.

In order to take advantage of this warranty of fitness for a particular purpose, you should tell the Seller as much as you can about your application, and about the hardware you will run it on. Incidentally, this also happens to be the best way to make the best use of the Seller who knows his stuff.

Let's change the first example just a bit more. Instead of asking the Seller for advice, I carefully studied the advertisements in *Creative Computing*, and went to purchase the program because of the store's advertising that the program would handle 20,000 separate inventory items, and find any one of them in .6 seconds with only one disk drive. A good case can be made that I can take advantage of the store's expressed warranty that the program

Retail Roster



CALIFORNIA

Advance Data Concepts—2280 Diamond Blvd., Concord, 94520; (415) 671-9016. 9-5 Mon-Fri. Vector-Graphic, CP/M Software Headquarters-User's Group.

D.E.S. Data Equipment Supply—8315 Firestone, Downey 90241. (213) 923-9361. 7 days. Commodore PET specialists. Hardware Software, Books, Mags, Supplies, In House Maintenance.

CONNECTICUT

Computerworks—1439 Post Rd., East Westport 06880; (203) 255-9096. 12-6 Tues-Fri, 12-9 Thu, 10-5 Sat.

GEORGIA

Atlanta Computer Mart—5091 Buford Hwy, Atlanta 30340; (404) 455-0647. 10-6 Mon-Sat

ILLINOIS

Computer Land/Downers Grove—136 Ogden Ave., Downers Plaza 60515; (312) 964-7762. 10-6 Mon.-Sat., 10-8 Tue., Thurs. Apple, Atari, Osborne Zerox, Vector.

Data Domain of Schaumburg—1612 E. Algonquin Rd., Schaumburg 60195; (312) 397-8700. 12-9 Tues-Fri, 11-5 Sat. Apple, Alpha Micro, Hewlett-Packard Calculators. Largest book and magazine selection.

Farnsworth Computer Center—1891 N. Farnsworth Ave., Aurora, IL 60505; (312)851-3888. 10-8 Mon-Fri, 10-5 Sat. Apple, Hewlett-Packard series 80 systems, HP Calculators, IDS Printers.

Gavin Computers—5935 W. Addison St., Chicago; (312) 286-4232. Mon.-Thurs. 9-8:30, Tues.-Sat. 9-6. Apple B & H, Atari & Commodore Systems.

Lillipute Computer Mart, Inc.—4446 Oakton, Skokie 60076; (312) 674-1383. M-F 10:30-8 pm, Sat 10-6. We sell Cromemco, Gimix, Bell & Howell, NorthStar and others. Starting our fifth year in business.

To include your store in Creative Computing's *Retail Roster, call the Advertising Department at (201) 540-9168*

Video Etc.—465 Lake Cook Plaza, Deerfield 60015; (312) 498-9669; Open Everyday. Strong software support for Apple, Atari.

The Video Station—872 So. Milwaukee Ave., Libertyville; (312) 367-8600. Open 7 days. Atari Computers, Hardware and Software.

MASSACHUSETTS

Neeco—679 Highland Ave, Needham 02194; (617) 449-1760. 9-5:30 Mon-Fri. Commodore, Apple, Superbrain, Atari

Science Fantasy Bookstore—18 Eliot St., Harvard Sq., Cambridge 02138; (617)547-5917. 11-5 Mon-Sat, 11-8 Thur. Apple & TRS-80 games, Epyx, Microsoft, Creative Computing.

MICHIGAN

Upstate Computer Shop—629 French Rd., Campus Plaza, New Hartford 13413; (315) 733-9139. Mon—Fri 10—6, Sat 11—5. Apple—Commodore—Data General.

Computer Center—Garden City; (313) 425-2470 & West Bloomfield; (313)855-4220; Books, Magazines, Hardware and Software for Apple, Northstar, TRS-80 & PET.

NEVADA

Home Computers—1775 E Tropicana #6, Las Vegas 89109 (702) 798-1022. 10-7 Mon-Sat. Apple, Commodore, Atari, AIM 65, (Books) Sales & Service

NEW JERSEY

Computermook—Rt. 46, Pine Brook Plaza, Pine Brook 07058; (201) 575-9468. 10-6:30 MTWS, 10-8 Thurs., Fri. Apple/Commodore Authorized dealer.

Stonehenge Computer Corp. — 89 Summit Ave., Summit 07901; (201) 277—1020. 10 am— 6 pm Mon.— Fri. Apple/Bell & Howell/Cannon/ Authorized Dealer, Sales and Service.

Software City — Pine Brook, 101 Rt. 46 East, 07058; (201) 575—4574. Bus/Rec Utility/Home Programs for TRS—80, Atari, Apple and PET. 10—25% off list.

Software City — River Edge, 111 Grand Ave., 07661; (201) 342—8788. Bus/Rec/ Utility/Home Programs for TRS—80, Apple, Atari and PET. 10—25%off list.

NEW YORK

Programs Uniimited—20 Jericho Turnpike, Jericho, NY 11753; (516)333-2266. 10-8 Mon-Sat. The largest microcomputer software selection available.

The Computer Center—31 East 31st St., New York 10016; (212)889-8130. 10-7 Mon-Fri, 11-6 Sat, 10-8 Thur.

Upstate Computer Shop—629 French Rd., Campus Plaza, New Hartford 13413; (315)733-9139. 10-6 Mon-Fri, 11-5 Sat. Apple—Commodore—Data General.

OHIO

Abacus II—1417 Bernath Pkwy , Toledo 43615; (419) 865-1009.

Micro Mini Computer World—74 Robinwood Ave., Columbus 43213; (614) 235-5813/6058. 11-7 Tues-Sat. Authorized Apple/Commodore dealer. Sales, Service, Business Software.

North Coast Computers — 626 Dover Center, Bay Village 44140; (216)835—4345; 10—6 Mon.—Fri., 10—8 Tues., Thurs., 9:30—5 Sat. Apple/Atari/Vector Graphics/Data General.

WISCONSIN

Petted—4265 W. Loom's Rd. (I-894-Hwy 36, Milwaukee 53221; (414)282-4181. 12-8 Mon-Fri, 10-4 Sat. Authorized Commodore PET, CBM, VIC dealer. Books, Magazines, Chips, etc.

Forum, continued...

will do exactly what the advertising states. Such an action gives rise to a warranty by description or model, pursuant to Section 2-313 of the Uniform Commercial Code.

So we have three types of warranties that are possible without anyone specifically using the language "I warrant...":

1. Implied warranty of merchantability;
2. Implied warranty of fitness for a particular purpose; and
3. Express warranty arising out of advertising, example or model.

That's good for the purchaser, and I wish I could end this article right here. Unfortunately, I forgot to tell you what actually happened in the first example. The Seller told me that he wasn't sure if the program would work for my purpose. In fact he doubted that it would work at all. Actually, he refused to sell the program to me unless I signed an agreement stating:

"Seller makes no warranties, either express or implied, with respect to the XYZ data package, its quality, performance, merchantability, or fitness for any particular purpose. This software is sold "as is." The entire risk as to its quality and performance is with the buyer. Should the program prove defective following its purchase, the buyer, and not the seller, assumes the entire cost of all necessary servicing, repair, or correction and any incidental or consequential damages. In no event will the seller be liable for direct, indirect, incidental, or consequential damages resulting from any defect in the software, even if seller has been advised of the possibility of such damages. Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you."

Now I suggest that you save this paragraph, because it not only seems to take away the implied warranties that were so helpfully supplied by the UCC, but also contains limitations on damages and some language required by federal law called the Magnusson-Moss Consumer Warranty Act. And these are all topics that we will discuss in future columns. At this point I will say nothing more than if I signed the agreement as part of a contract of purchase of the XYZ package, it is very likely that I would be without any recourse if I walked home, and the program didn't boot, or if it booted, but just didn't work the way the advertising said it would. The tough question is: What happens if I never sign the agreement, and never even see the agreement until I get home and cut through the shrink wrap? And that's a very real question, because that paragraph is copied (with only names removed) from the pages of a well known software manual.

Appendix

Excerpted from the Uniform Commercial Code

Sec. 2-313. Express Warranties by Affirmation Promise, Description, Sample.

(1) Express warranties by the seller are created as follows:

a) Any affirmation of fact or promise made by the seller to the buyer which relates to the goods and becomes part of the basis of the bargain creates an express warranty that the goods shall conform to the affirmation or promise.

(b) Any description of the goods which is made part of the basis of the bargain creates an express warranty that the goods shall conform to the description.

(c) Any sample or model which is made part of the basis of the bargain creates an express warranty that the whole of the goods shall conform to the sample or model.

(2) It is not necessary to the creation of an express warranty that the seller use formal words such as "warrant" or "guarantee" or that he have a specific intention to make a warranty, but an affirmation merely of the value of the goods or a statement purporting to be merely the seller's opinion or commendation of the goods does not create a warranty.

Sec. 2-314. Implied Warranty: Merchantability; Usage of Trade.

(1) Unless excluded or modified, a warranty that the goods shall be merchantable is implied in a contract for their sale if the seller is a merchant with respect to goods of that kind. Under this section the serving for value of food or drink to be consumed either on the premises or elsewhere is a sale.

(2) Goods to be merchantable must be at least such as

(a) pass without objection in the trade under the contract description and

(b) are fit for the ordinary purposes for which such goods are used; and

(c) run within the variations permitted by the agreement of even kind, quality and quantity within each unit and among all units involved; and

(d) conform to the promises or affirmations of fact made on the container or label if any.

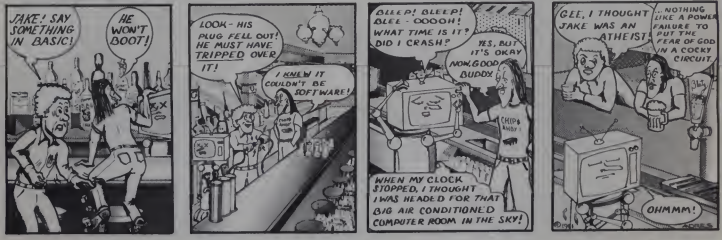
(3) Unless excluded or modified, other implied warranties may arise from course of dealing or usage of trade.

Sec. 2-315. Implied Warranty: Fitness for Particular Purpose.

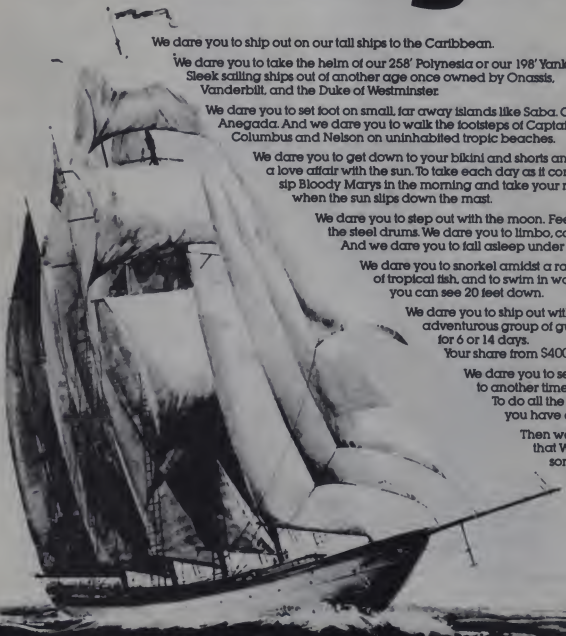
Where the seller at the time of contracting has reason to know any particular purpose for which the goods are required and that the buyer is relying on the seller's skill or judgment to select or furnish suitable goods, there is unless excluded or modified under the next section an implied warranty that the goods shall be fit for such purpose. □

Bit Pit

Chas Andres


JAKE! SAY SOMETHING IN BASIC!
HE WON'T BOOT!
LOOK - HIS PLUG FELL OUT! HE MUST HAVE TRIPPED OVER IT!
I KNEW IT COULDN'T BE SOFTWARE!
BLEEP! BLEEP! BLEE - OOOOH! WHAT TIME IS IT? DID I CRASH?
YES, BUT IT'S OKAY NOW, GOOD BUDDY
CHIP'S Ahoy
WHEN MY CLOCK STOPPED, I THOUGHT I WAS HEADED FOR THAT BIG AIR CONDITIONED COMPUTER ROOM IN THE SKY!
GEE, I THOUGHT JAKE WAS AN ATHEIST!
NOTHING LIKE A POWER FAILURE TO PUT THE FEAR OF GOD IN A COCKY CIRCUIT.
OHMMM!

We dare you.



We dare you to ship out on our tall ships to the Caribbean.

We dare you to take the helm of our 258' Polynesia or our 198' Yankee Clipper. Sleek sailing ships out of another age once owned by Onassis, Vanderbilt, and the Duke of Westminster.

We dare you to set foot on small, far away islands like Saba, Carriacou, Anegada. And we dare you to walk the footsteps of Captain Bligh, Columbus and Nelson on uninhabited tropic beaches.

We dare you to get down to your bikini and shorts and have a love affair with the sun. To take each day as it comes, sip Bloody Marys in the morning and take your ration o' grog when the sun slips down the mast.

We dare you to step out with the moon. Feel the throbbing of the steel drums. We dare you to limbo, calypso and goombay. And we dare you to fall asleep under a star-filled sky.

We dare you to snorkel amidst a rainbow of tropical fish, and to swim in waters so clear you can see 20 feet down.

We dare you to ship out with an adventurous group of guys and gals for 6 or 14 days. Your share from $400.

We dare you to set sail to another time, another land. To do all the things you have always wanted to do.

Then we dare you to tell us that Windjammin' was something besides the greatest vacation in your life.

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Post Office Box 120, Miami Beach Florida 33139 | 305 373-2090

Capn Mike
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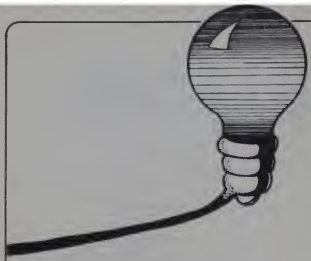
Might take your dare
Send my free full color Great Adventure Booklet on the 6 and 14 day cruises to the Caribbean and West Indies

Name | Address

City/State/Zip



ucts...new products...new

COMPUTERS

DESKTOP COMPUTER FROM IBM

IBM has announced a desktop business computer that combines data processing and word processing in a system designed for first-time users.

IBM System/23 Datamaster can include two computer workstations, which permit two people to use the system simultaneously.

The Basic language used by Datamaster is compatible with the Basic available on IBM's System/34.

The computer's processing unit features single or dual integrated disk drives with storage capacity from 0.3 megabytes to 2.2 megabytes which may be expanded with an optional disk unit to provide maximum storage of up to 4.4 megabytes.

The workstation will display up to 1,920 characters on a 12" screen and has main memory capacity of up to 128K in 32K increments.

A full-function data processing installation, with a single computer workstation and an 80 character-per-second printer, will cost $9,830.

IBM, General Systems Division, Attn: Bob Murphy, 5775 East Glen Ridge Dr., Atlanta, GA 30328.

CIRCLE 351 ON READER SERVICE CARD

PMC-81: TRS-80 "WORK-ALIKE"

Personal Micro Computers has added the PMC-81 to its TRS-80 Model I work-alike product line.

The PMC-81 has 16K of memory, 14K of ROM, uses a Z-80 microprocessor and provides a keyboard, cassette interface and video monitor interface in the unit. It uses the EXP-100 Expander to add interfaces for minifloppy disks, printer, RS-232C and S-100 bus.

The PMC-81 has a complete professional keyboard with lower case letters and true descenders provided as standard, as well as a 15-key numeric pad and four function keys. $939.

Personal Micro Computers, Inc., 475 Ellis St., Mt. View, CA 94043. (415) 962-0220.

CIRCLE 352 ON READER SERVICE CARD

MULTITASKING MICROCOMPUTER

A multi-tasking desktop microcomputer has been introduced by the TRW-Fujitsu Company.

Designated Affinity 16, the computer will operate as a stand-alone unit, on-line to a central computer or in a network environment, and can perform batch, on-line or distributed processing applications.

The central processing unit includes a 16-bit microprocessor and 128K bytes of memory. Two minifloppy disk drives can each record 320K on two dual-sided, double-density disks. Up to 2.5 megabytes of auxiliary disk storage is available with an 8" floppy disk drive unit.

The CRT display features a 12", 1920-character screen, 192 display patterns and versatile display functions. The full ASCII keyboard includes alphanumeric keys, ten-key, and 12 programmable function keys.

Prices will be in the $6,000 to $10,000 range.

The TRW-Fujitsu Company, 9841 Airport Blvd., Suite 620, Los Angeles, CA 90045. (213) 535-3821.

CIRCLE 353 ON READER SERVICE CARD

META TECHNOLOGIES

26111 Brush Avenue, Euclid Ohio 44132
CALL TOLL FREE 1-800-321-3552 TO ORDER
IN OHIO, call (216) 289-7500 (COLLECT)

1001 THINGS TO DO WITH YOUR PERSONAL COMPUTER

BY MARK SAWUSCH

333 pages $7.95

333 pages, written in simple terms, of "what-to-do" and "how-to-do-it". Suitable not only for microcomputers, but for programmable calculators as well. Includes program listings, formulas, a glossary of computer terms and more! Definitely a MUST BUY!

A PARTIAL LIST OF APPLICATIONS

- Real Estate Evaluation
- Astrology
- Income Tax
- Speed Reading
- Personality Test
- Statistical Analysis
- Logic Circuit Analysis
- Carpenter and Mechanic's Helper
- General Purpose Clock Timer
- Test Your Typing Speed
- Finances & Investments
- Biorythm
- Energy Efficiency
- Antenna Design
- Letter Writing
- Recipe Index/Calculator

"OTHER MYSTERIES" VOLUME III

by Dennis Kitsz

Call now and place your order for this new book, "THE CUSTOM TRS-80™ & OTHER MYSTERIES", from IJG, Inc. More than 300 pages, with over 60 photographs, of projects for the hardware hobbyist. Includes schematics, PC layouts, software driver code, etc. for such do-it-yourself undertakings as high resolution graphics, reverse video, real-time clock/calender, music synthesis, ROM/RAM additions and more!

THE CUSTOM TRS-80™ $29.00
CALL FOR AVAILABILITY

MICROPARAPHERNALIA

NEWDOS by APPARAT

NEWDOS/80 by Apparat $149.95
NEWDOS+ to NEWDOS/80 UPGRADE ..... CALL
NEWDOS+ with ALL UTILITIES
- 35-track $69.95
- 40-track $79.95

BOOKS

TRS-80™ DISK AND OTHER MYSTERIES .. $19.95
MICROSOFT™ BASIC DECODED $29.95

Let your TRS-80™ Teach You

ASSEMBLY LANGUAGE

REMSOFT's unique package, "INTRODUCTION TO TRS-80® ASSEMBLY PROGRAMMING" includes ten 45-minute lessons on audio cassettes, a display program for each lesson providing illustration & reinforcement, and a text book on TRS-80® Assembly Language Programming. Includes useful routines to access keyboard, video, printer and ROM. Requires 16K - Level II, Model I.

REMASSEM-1 ..... $69.95
FOR DISK SYSTEMS $74.95

Let your TRS-80™ Teach You

ASSEMBLY LANGUAGE DISK I/O TECHNIQUES

REMSOFT does it again! REMDISK-1 is a concise, capsulated supplement to REMASSEM-1. Package consists of two 45-minute lessons on audio cassettes, and display programs providing illustration and reinforcement. Provides specific track and sector I/O techniques, and sequential and random file access methods and routines.

REMDISK-1 ..... $29.95

Let Your TRS-80™ Test Itself With

THE FLOPPY DOCTOR & MEMORY DIAGNOSTIC

by DAVE STAMBAUGH

A complete checkup for your Model I. THE FLOPPY DOCTOR completely checks every sector of 35- or 40-track disk drives. Tests motor speed, head positioning, controller functions, status bits and provides complete error logging. THE MEMORY DIAGNOSTIC checks for proper write/read, refresh, executability and exclusivity of all address locations. Includes both diagnostics and complete instruction manual.

SYSTEM DIAGNOSTICS $19.95

An improved version of the SYSTEM DIAGNOSTICS above. Designed for single or double density, 35-, 40-, 77-, or 80-track disk drives. Includes new and modified tests. Features THE FLOPPY DOCTOR, Version 3.0.

SYSTEM DIAGNOSTICS-V3.. $24.95

Single Sided, Soft-Sectored 5¼-inch, (for TRS-80™) Mini-floppy

DISKETTES $21.95 box of 10

PLAIN JANE™

These are factory fresh, absolutely first quality (no seconds!) mini-floppies. They are complete with envelopes, labels and write-protect tabs in a shrink-wrapped box.

PLAIN JANE™ Diskettes $21.95
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Introducing MTC's premium generic diskette. Single-Sided, Soft-Sectored, DOUBLE-DENSITY, 5¼-inch diskettes with reinforcing HUB-RINGS. Individually 100% ERROR-FREE certified. Invest in GOLD!

PLAIN JANE™ *Gold* $25.95

VERBATIM'S PREMIUM DISKETTES

DATALIFE™

Seven data-shielding improvements mean greater durability and longer data life. These individually, 100% error-free certified diskettes feature thicker oxide coating, longer-lasting lubricant, improved liner, superior polishing and more! Meets or exceeds IBM, Shugart, ANSI, ECMA and ISO standards.

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5¼-inch (box of 10)
- MD525-01 ..... $26.95
- 10 boxes of 10 (each box) $25.95

8-inch FLOPPIES
Double-Density, FD34-8000 . $43.95

'RINGS' & THINGS

- HUB RING KIT for 5¼" disks. $10.95
- HUB RING KIT for 8" disks. $12.95
- REFILLS (50 Hub Rings) ..... $ 5.95
- CLEANING KIT for 5¼" drives $24.95
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CIRCLE 228 ON READER SERVICE CARD

PORTABLE WORD PROCESSING COMPUTER

A British-made "computer in a briefcase" contains a word processor, an 8" x 8" viewing screen with a capacity of 480 characters, bubble memory and a telephone coupler.

The Microdata 8400 weighs less than 17 lbs. and has a standard keyboard. The acoustic coupler allows the unit to transmit or receive data or programs over public telephone lines, and it operates on both American and European communications standards.

The 94K bubble memory stores the data and is not erased when the power is switched off.

Microdata Computers, Belvedere Works, Bilton Way, Hayes, Middlesex UB3 3ND England.

TI99/4A HOME COMPUTER CONSOLE

Texas Instruments Incorporated has announced an enhanced version of the TI-99/4 home computer. Designated the TI99/4A, the new console features upper and lower case letters arranged as on a standard typewriter keyboard. The Shift key activates the uppercase letters and can be locked by depressing the Alpha Lock key.

An automatic repeat function has been added, and special keys have been included to simplify access to special computer functions. $525.

Texas Instruments Incorporated, Consumer Relations, P.O. Box 53, Lubbock, TX 79408. (800) 858-4565; in Texas (800) 692-4279.

CIRCLE 355 ON READER SERVICE CARD

INTEGRATED DESKTOP COMPUTER

North Star Computers has introduced an integrated desktop standalone system which offers graphics capabilities, a 12" display, two 5 1/4" high-capacity floppy disk drives, an 87-key Selectric-style keyboard and a choice of optional operating and applications software.

The Advantage is built around a 4-megaHertz Z-80A and has 64K of RAM. It features a 12" bit-mapped CRT display to produce bar charts, pie diagrams, plotted graphics and three-dimensional visuals, driven by an additional 20K of RAM.

In addition to the double-sided, double-density floppy disks, the chassis contains six slots for plug-in option cards such as a parallel interface for either a printer or a hard disk, an RS-232C serial-port board, or North Star's Floating Point Board for performing high-speed floating point arithmetic with up to 14 digit precision.

An operating system called Application Software Program manages the Advantage resources, and provides an Indexed Sequential Access Method and Random File Management system interface for the application software packages which include the Accounting Application Software Package—GeneralLedger, Accounts Receivable, AccountsPayable (Inventory Control, Order Entry/Invoicing); North Word, a word processing package; Mail Manager, a mailing list processor; and InfoManager, a data manager.

Also available is graphics CP/M, a superset of CP/M that allows the user to take advantage of the graphics capabilities of Advantage and also to run all CP/M-compatible software. North Star also offers Fortran and Cobol under CP/M. $3999.

North Star Computers, Inc., 14440 Catalina St., San Leandro, CA 94577. (415) 357-8500.

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The book will take you through everything programmers learn. Its easy to understand and the large type makes it easy to read. You'll find out how to put together a flowchart, and how to get your computer to do what you want it to do. There's a lot to learn, but **Computers For Kids** has 12 chapters full of information. You'll even learn how to write your own games and draw pictures that move.

Just so the folks and your teachers won't feel left out, there's a special section for them. It gives detailed lesson ideas and tells them how to fix a lot of the small problems that might pop up. Hey, this book is just right for you. But you don't have to take my word on that. Just listen to what these top educators have to say about it:

Donald T. Piele, Professor of Mathematics at the University of Wisconsin-Parkside says, "**Computers For Kids** is the best material available for introducing students to their new computer. It is a perfect tool for teachers who are learning about computers and programming *with* their students. Highly recommended."

Robert Taylor, Director of the Program in Computing and Education at Teachers College, Columbia University states, "it's a good idea to have a book *for children*."

Not bad, huh? Okay, you can let the adults back in the room. Don't forget to tell them **Computers For Kids** by Sally Greenwood Larsen cost only $3.95. And tell them you might share it with them, if they're good. Specify edition on your order: TRS-80 (12H); Apple (12G); Atari (12J).

Your local computer shop should carry **Computers For Kids**. If they don't ask them to get it or order by mail. Send $3.95 payment plus $2.00 for one, $3.00 for two or more for shipping and handling to Creative Computing Press, P.O. Box 789-M, Morristown, NJ 07960.

creative computing press

CIRCLE 350 ON READER SERVICE CARD

SYSTEM SUPPORTS 255 USERS

Molecular Logic Corporation has announced the DIRAC computer system.

The system can support up to 255 independent users with virtually no impact on system throughput. This is accomplished by providing each user with a complete 64K microprocessor module which can access a common data base.

The DIRAC system features two microprocessor module types; one for disk storage management and the other dedicated to each individual user. Also included are 30Mb of disk storage and a standard 8" floppy disk drive for software interchange and data backup.

The system is based on the Z-80A microprocessor and features the CP/M operating system.

The basic DIRAC system sells for $9000. Additional processor modules are priced at $1250.

Molecular Logic Corporation, 10311 S. DeAnza Blvd., Suite 4A, Cupertino, CA 95014, (408) 446-9077.

CIRCLE 357 ON READER SERVICE CARD

COMPUTHINK EAGLE 32

Computhink has announced the Eagle 32 family of microcomputer systems. The two new systems are based on the Motorola 68000, 16/32 bit, microprocessor chip.

The two systems, Model 10 and 20, are similar except for quantity of mass storage available standard with the system. Each has a 128K byte main memory. The Eagle 32 Model 10 (S6650) has a 1.6 megabyte storage capacity expandable to 3.2 megabytes on 5 1/4" floppy disk as compared with 2.4 megabyte storage capacity, expandable to 4.8 megabytes for the Eagle 32 Model 20 ($7650).

Both systems are expandable to one megabyte of main memory. All of memory is directly addressable by the computer allowing large application programs to be executed.

The Eagle 32 is essentially a dedicated commercial or scientific application system. Initial deliveries will include a batch operating system, Basic+, Forth+, and Tiny Fortran.

Computhink, 965 West Maude Ave., Sunnyvale, CA 94086, (408) 245-8033.

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CIRCLE 247 ON READER SERVICE CARD

The only thing you can do with a baked Apple is eat it.

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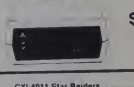

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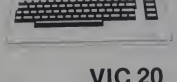

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CIRCLE 148 ON READER SERVICE CARD

New Products, continued...

SMALL BUSINESS COMPUTER

The Datamac 1255 is a self-contained, portable computer system which packages a Z-80 processor, 64K bytes of RAM, I/O ports, keyboard, CRT, and two 5 1/4" double-sided, double-density mini-floppies in a cabinet no bigger than a normal CRT terminal.

The industry standard CP/M operating system is offered along with software, including Basic, Fortran, Cobol, Pascal, Forth, macroassemblers, business packages, text editors, word processors, and utilities.

A unique feature of the Datamac 1200 series is the ability to add on external floppy drives of any configuration—5 1/4" or 8", single or double density, single or double sided, 48 or 96 tracks per inch.

List prices of the 1200 series range from $2995 to $4995 depending on floppy disk configuration.

Datamac Computer Systems, 3333-F Octavius Dr., Santa Clara, CA 95051. (408) 727-0561.

CIRCLE 359 ON READER SERVICE CARD

1 TO 20 MEGABYTE SYSTEM

Tarbell Electronics announces the Empire Series System, which includes a Z-80 4 Mhz CPU with memory management timer and full interrupt capability, two RS-232 serial ports with handshaking, 64K bytes of RAM (expandable to 256K), double-density floppy disk interface, two double-density floppy disk drives, cabinet, power supply and cables.

The systems software includes: the Digital Research CP/M 2.2 disk operating system, Tarbell Disk Basic, Tarbell Database System, and all manuals and documentation.

The applications software available includes word processing, inventory control with bill of materials, mailing lists, general ledger, payables, receivables, payroll with cost accounting and order entry.

Tarbell also offers the Digital Research MP/M Multi-User Operating System and four additional RS-232 serial ports.

Tarbell Electronics, 950 Dovlen Pl., Suite B, Carson, CA 90746. (213) 538-4251.

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TERMINALS & I/O

PRINTER/CASSETTE INTERFACE FOR POCKET COMPUTER

Radio Shack offers a printer and cassette interface for the TRS-80 Pocket Computer. The combined printer and cassette interface unit (26-3505) comes complete with rechargeable batteries, an AC adapter/charger cassette recorder connecting cable, replaceable printer ribbon cartridge, three rolls of paper and an owner's manual.

Utilizing the pocket computer's "PRINT" and "LIST" commands, the printer provides a legible 16-column alphanumeric printout of programs, data, instructions and results on ordinary electronic cash register type paper.

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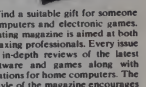

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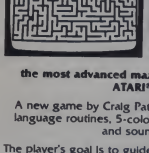

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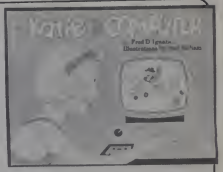

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puzzle answers

Potted Problem: The volume of each pot is its inside depth times its inside base area. The smallest pot is a six-inch square on the inside (36 square inches) but we don't know its depth. Call the depth of this pot X so the volume is 36X cubic inches. The next pot is 8 by 8 by (X + 1) or 64X + 64) cubic inches. The second largest pot is 10 by 10 by (X + 2) or (100X + 200) cubic inches, and the largest is 12 by 12 by (X + 3) or (144X + 432) cubic inches. We're told that the three smaller pots together have the same volume as the largest one alone, so

36X + 64X + 64 + 100X + 200 = 144X + 432
56X = 168 inches
X = 3 inches.

The four pots hold: 36X = 108 cubic inches
64X + 64 = 256
100X + 200 = 500
144X + 432 = 864
1728 cubic inches = 1.0 cubic foot or very nearly 7½ gallons.

Cornered: No. The board consists of 32 black and 32 white fields. Every domino piece will cover a white and a black field together. However the two corner fields which I cut out of the board are both white, leaving 32 fields of one color and 30 fields of the other color, making it impossible to cover the board with 31 domino pieces.

A Punctuation Problem: THAT THAT IS, IS. THAT THAT IS NOT, IS NOT, IS THAT IT? THAT IS IT.

A Matchless Puzzle: This problem is solved by doing the operations backwards. We start with three piles of 16 matches.

The third operation consisted of doubling the first pile and removing that amount from the third pile.

1: 16 ÷ 2 = 8 2 : 16 3 : 16 + 8 = 24

Applying this to the second operation we get:

1 : 8 2 : 16 + 12 = 28 3 : 24 + 2 = 12

Doing this once more:

1 : 8 + 14 = 22 2 : 28 ÷ 2 = 14 3 : 12

Therefore, we started out with 22, 14 and 12.

The Problem of the Burning Candles: It takes 6 hours for the second candle to burn the same amount as the first candle burns in 4½ hours. Therefore the rate of the second candle is only ⅔ times that of the first candle.

rate = distance / time

let x = length of first candle

then x − 1 = length of second candle

⅔ times the rate of the first = rate of the second

⅔ times x/9 = (x − 1)/10 which resolves x being equal to 6.

So one candle is 6 inches and the other candle is 5 inches.

The Star Trek Puzzle: TIME, TAME, TARE, WARE, WARP.

Another True or False Puzzle: If Orange, the first would have lied and answered "I'm Purple." If Purple, he would have said so. Either way, the windblown words were "I'm Purple." It follows that the second person is Purple because he reported truly the first's reply. Since the first two are Purple, the third is lying and has to be Orange.

What Comes Next? The next word must denote an emotion not already used in the list, (we used Joy, Grief, Humor, etc. You might try Sad or Happy). The list is a concepts progression. (It goes A, then AB, then ABC, then ABCD.) The concepts are: A = physical properties; B = emotions; C = colors; D = tastes.

A Counter Problem: House numbers.

An Ageless Problem: Ann is 18.

A Loopy Problem: Place your forefinger inside the loop and give the loop a quick sidewise blow. It must be a sharp blow and you must follow through sweeping the loop out from under the dime. The dime will then fall straight down and into the bottle.

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